Smithsonian

July 1992

Arata Isozaki's flagship building for Team Disney is a whimsical feast for the senses (p. 58)

PowerBook™

It's from Apple.
It's not just a new computer.
It's a new idea.

It will let you run MS-DOS software.
It will let you run Macintosh® software.
It will let you run away.

It's easy on your eyes.
It's easy on your wrists.
It's easy.

It does more than you imagine.
It costs less than you think.

The power to be your best.

For the name of the nearest authorized Apple reseller, call 800-446-3000, ext. 700. To run MS-DOS software, simply install a program like SoftPC. *©1992 Apple Computer, Inc. Apple, the Apple logo, Macintosh and "The power to be your best" are registered trademarks, and PowerBook is a trademark of Apple Computer, Inc. MS-DOS is a registered trademark of Microsoft Corporation. SoftPC is a registered trademark of Insignia Solutions Inc.*

July 1992

Smithsonian

Volume 23, Number 4

Table of Contents

Cover: Known for playful designs, Isozaki placed a yellow sundial stylus atop the 120-foot-high truncated cone that dominates the entrance lobby of the Disney headquarters in Lake Buena Vista, Florida (p. 58)
Photograph by Peter Aaron/Esto Photographics

10 *Smithsonian horizons* by Secretary Adams
12 *Letters to the Editor*
21 *Picture credits*
22 *Phenomena, comment and notes* by Michael Robinson

30 **The quiet revolution in 'hand talk'**
American Sign Language, once called a form of pidgin English, is now seen as a unique, complex language
By Richard Wolkomir, photographs by Lynn Johnson

44 **Rustle ye rosebuds while ye may**
Rose rustlers rescue and identify the fragrant, hardy blooms of yesteryear to introduce into modern gardens
By Bruce Fellman, photographs by Will van Overbeek

58 **The pleasing places of Arata Isozaki**
He feels architects should create what they like; at the Olympics, we'll see what he "liked" in Barcelona
By Michael Webb

70 **How do you get to Pelycosaur Heaven?**
Jerry MacDonald isn't telling, because that's where he's found the world's best Permian fossil trackways
By Doug Stewart, photographs by Eduardo Fuss

82 **From Sam Houston, a surprising bonus**
In a fierce, 18-minute battle at San Jacinto in 1836, he freed Texas from Mexico—and launched the Sunbelt
By David Nevin, illustrations by Charles Shaw

92 **O Possums! New Zealand's immigrants run amok**
As the fur trade dwindles, brushtails are spreading disease, defoliating the countryside—and multiplying
By Noel Vietmeyer, photographs by Arno Gasteiger

102 **Who was 'the lout who built this route'?**
The 50th birthday of the 1,442-mile Alaska Highway is celebrated by many—but not all—who've known it
By John Krakauer

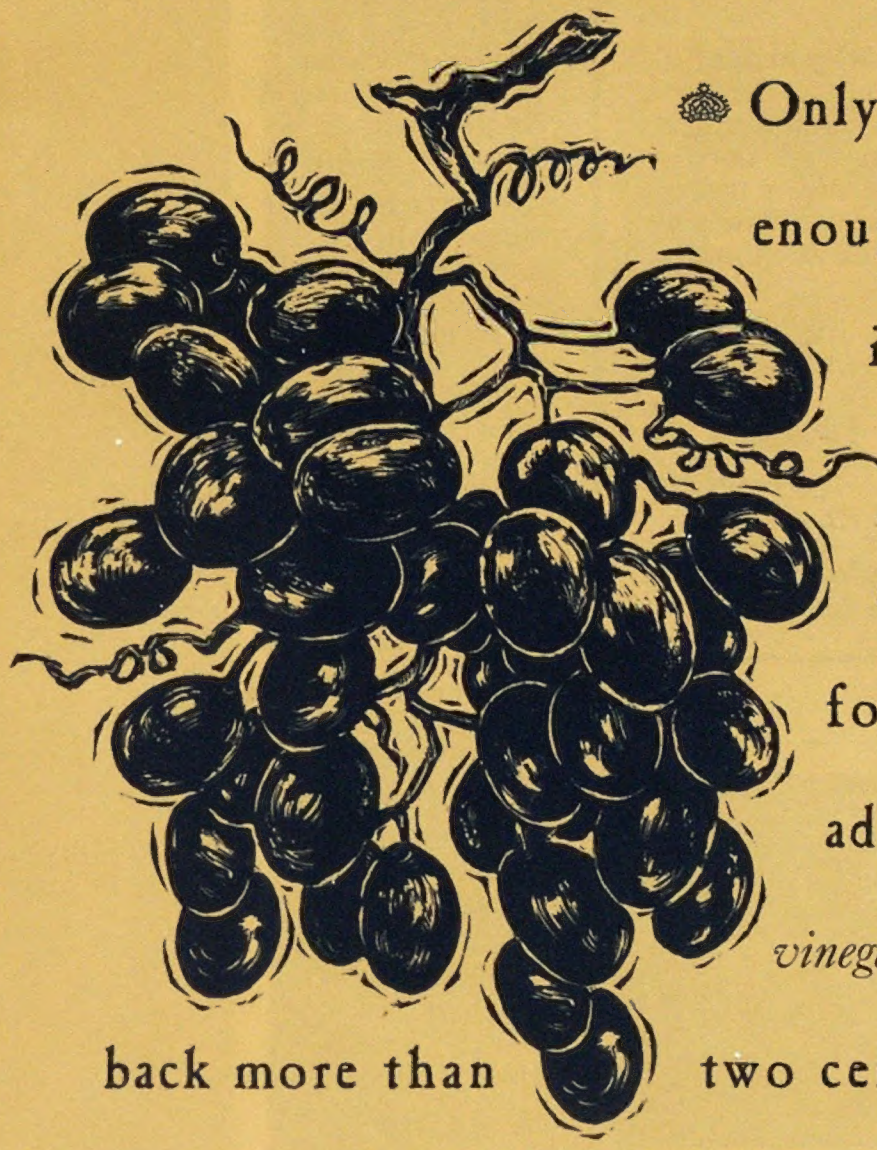
113 **The truth about trash**
The Garbage Project, a 20-year study of the stuff we throw away, debunks some myths about landfills
By William Rathje and Cullen Murphy
Illustrations by Margaret Scott

123 *Book reviews*
124 *Additional reading*
125 *July events at the Smithsonian*
126 *Smithsonian tours, seminars and expeditions*

128 **It was a wonderful toy and a glorious war**
By Barbara Holland

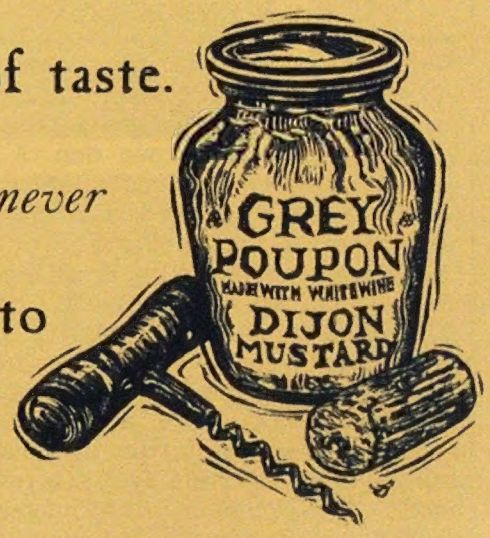
Smithsonian (ISSN 0037-7333) is published monthly by the Smithsonian Associates, 900 Jefferson Drive, Washington, DC 20560.
© *Smithsonian Institution* 1992. *All rights reserved.*
Reproduction in whole or in part without permission is prohibited.
Subscription price $22 a year in U.S. and possessions, $35 elsewhere. 80 percent of dues is designated for magazine subscription. Single copy price, $3. Second-class postage paid at Washington, DC and additional mailing offices.
Editorial offices at 900 Jefferson Drive, Washington, DC 20560.
Advertising and circulation offices at 420 Lexington Ave., New York, NY 10170.
Members: Please address all subscription correspondence and change of address information to Smithsonian, P.O. Box 55593, Boulder, CO 80322-5593.
Postmaster: Send address changes to Smithsonian, P.O. Box 55593, Boulder, CO 80302-5593.

If you need a reason to try Grey Poupon, here's a whole bunch of them.



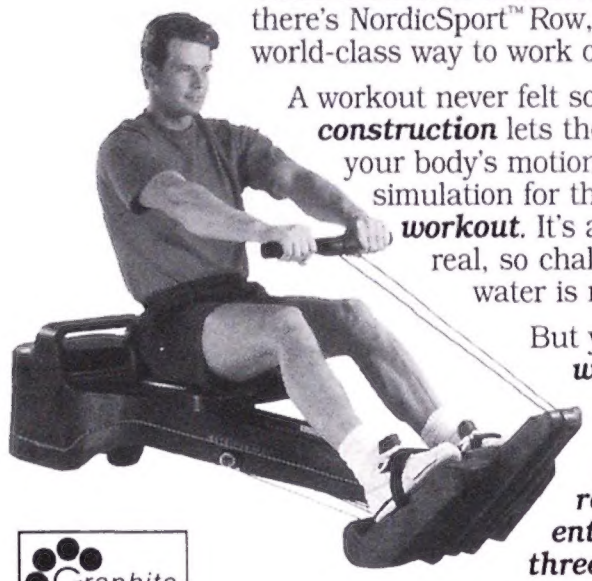
Only grapes from a *vintage* year are good enough to make the wine that is used in Grey Poupon® Dijon mustard. Just as only the *finest* mustard seed is good enough to be selected for *grinding* before being added to *spices* and fine *vinegar* in a recipe that dates back more than two centuries. The result is a Dijon mustard which has literally graced the table of Kings. And unlike other *savory* spices, Grey Poupon will never overwhelm your food. In fact, it may *stimulate* your sense of taste. Making flavors come to life in a way you might *never* have expected. When one has all these reasons to try Grey Poupon, why would one pick another?

In Roman times, new wine was mixed with crushed seed to form a paste called "Mustum Ardens," which we call mustard today.



Our World-Class Workout For Your World-Class Physique.

There are fitness machines for the average individual. And then there's NordicSport™ Row, from NordicTrack. The high-tech, world-class way to work out and ***create your best physique.***



A workout never felt so good. ***Our state-of-the-art graphite construction*** lets the NordicSport™ Row move and react to your body's motions, to provide the most authentic sport simulation for the most vigorous ***total-body workout***. It's a rowing motion so smooth, so real, so challenging—you'll hardly notice the water is missing.

But you will notice the ***development of a world-class physique*** as you exercise all your major muscle groups, strengthen your cardiovascular system, burn calories, increase lean muscle tissue, ***raise your metabolism and tone your entire body in as little as 20 minutes, three times a week.***

Graphite Edge™

Experience NordicSport™ Row. The one fitness program you can stick to, succeed at, and enjoy.

Call today for a 30 day in-home trial!

nordic sport™ by NordicTrack

For a FREE VIDEO and brochure call, 1-800-445-2231 ext. 50TG2

NordicTrack, Dept. #50TG2, 141 Jonathan Blvd. N., Chaska, MN 55318

© 1992 NordicTrack, Inc., A CML Company • All rights reserved

An historic collector's item . . .

THE LAST SOVIET CURRENCY

Genuine 100 Ruble Banknote of the Former Soviet Union

$19 WHILE THEY LAST

ONLY 2,000 AVAILABLE

SPECIAL OFFER TO NEW CUSTOMERS — The Soviet Union has crumbled and Communism is being buried in Russia, together with its chief architect Lenin. Now own one of the last official vestiges of "the Evil Empire": this obsolete 100 Ruble is already a collecting scarcity. Shown is a portrait of Lenin in both printed and "hidden watermark" forms. Ironically, the Soviet seal shows the Hammer and Sickle dominating the globe. The multicolor reverse displays the Kremlin. Supplies are limited and hard to obtain, so please order promptly. Very Fine quality. **$19 each. 5 for $89. Order #19216. Limit 5. To order by credit card, call toll-free 1-800-451-4463 at any time.** Or send a check or money order to: International Coins & Currency, Inc., 11 E. State St., Box 218, **Dept. #2465,** Montpelier, Vermont 05601. Add $2 for postage and handling. **100% Satisfaction Guarantee: 30-Day Home Examination.**

Swans Symbol of Lifelong Romance

In swan lore, when two young swans pair, they swim to a secluded spot, touch forming a heart, and become mated for life. Gliding dreamily across their imaginary pond, reflected light glitters on water droplets at wingtips represented by 14 tiny diamonds.

As a symbol of a lifelong romance, the Cross Swan Pin is a deeply moving gift conveying the essence of that soul-felt bond of love between two people. With genuine ruby eyes, 14K yellow gold combination pin-pendant comes beautifully giftwrapped with the sentiments expressed by this piece on a small card tucked inside the box. Shown actual size, $485.00. (Also available in 14K yellow gold with ruby eyes, no diamonds $325.00 or sterling silver with ruby eyes, no diamonds $135.00.)

Stop in, mail or phone orders 1-800-433-2988
Within the state of Maine 773-3107
Postage Pd. Sent within 24 hours UPS Second Day Air
For deliveries in Maine add 6% state sales tax
Visa, MasterCard or personal check
Satisfaction Guaranteed

Cross Jewelers
Manufacturing Jewelers since 1908
570S Congress St. Portland, ME 04101

© 92

Smithsonian

SECRETARY OF THE SMITHSONIAN INSTITUTION:
Robert McC. Adams

EDITOR:
Don Moser

ILLUSTRATIONS EDITOR:
Caroline Scott Despard

BOARD OF EDITORS:
Constance A. Bond
Jim Doherty
Timothy Foote
Marlane A. Liddell
Sally Scott Maran
Edgar Rich, Pictures
Nancy Seaman
John P. Wiley jr.

ASSOCIATE EDITORS:
Diane M. Bolz
Kathleen M. Burke
Frances R. Glennon
Bruce Hathaway
W. Eric Keller
Ruth Ravenel, Pictures
Jane D. Scholl

ASSISTANT EDITORS:
Suzanne Crawford
Marian Smith Holmes
Alison C. McLean
Lucinda Moore
Beth Py-Lieberman

CONTRIBUTING EDITORS:
Ralph Backlund
Edwards Park
Bennett Schiff

EDITORIAL ASSOCIATES:
Gloria Carr
Margot North

PUBLISHER:
Ronald C. Walker
Mary D. Haskin, Assistant

ADVERTISING:
Thomas H. Black, Associate Publisher
Louis Kolenda, Associate Director
James Sullivan, Associate Director
Patrick Riordan, Manager

CIRCULATION:
John O'Donnell, Associate Publisher
Adeline Sherr, Director
Marie Mulderrig, Promotion Manager
Michael Shectman, Fulfillment Manager

ADMINISTRATION:
Carey O. Randall, Associate Publisher
Mary Ellen Bobb, Business Director
Valerie Martin, Business Manager

PRODUCTION:
E. Cherry Doyle, Director
Greg Williams, Quality Manager
Briggs S. Cunningham, Editorial
Suzanne Aldrich, Advertising

FOUNDER:
S. Dillon Ripley

FOUNDING EDITOR AND PUBLISHER:
Edward K. Thompson

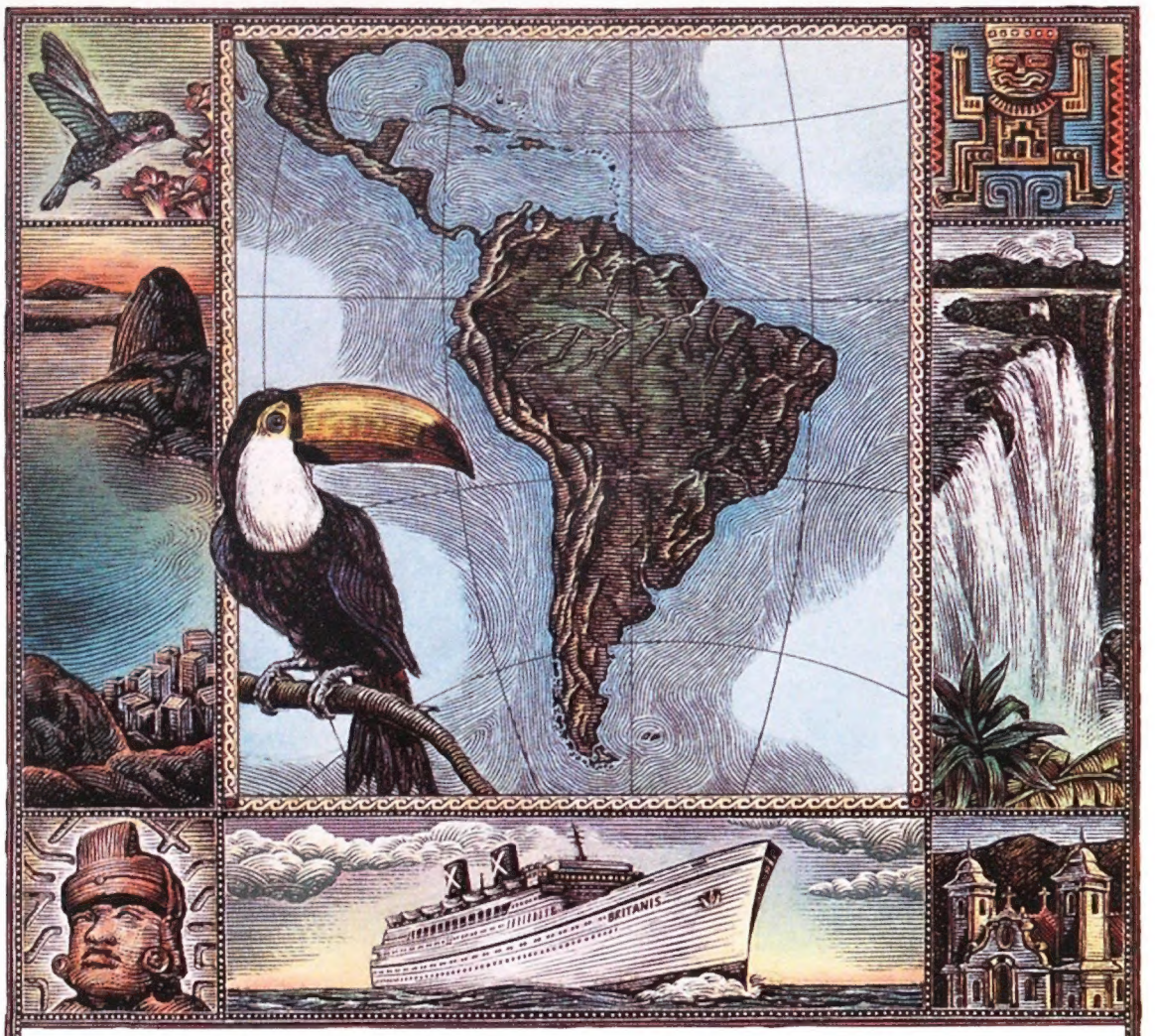
PUBLISHER EMERITUS:
Joseph J. Bonsignore

As I See It #7 in a series
Joyce Tenneson
'Renaissance Redux'
Polaroid 20x24 Polacolor Photography

THE BOLD LOOK OF **KOHLER**®

You remember the Renaissance, don't you? That's when art was art and the living was too. So we fashioned our Northern Italian™ Vanity Ensemble of the period in rich woods, opulent marble and exquisite hand detailing. See the Yellow Pages for a Kohler Registered Showroom. For complete product portfolio and idea book, send $8 to Kohler Co., Dept. AL8, Kohler, WI 53044 or call 1-800-4-KOHLER, ext. 36.

© 1989 by Kohler Co.



WE MADE SOUTH AMERICA FIT YOUR SCHEDULE!

INTRODUCING FANTASY'S 24- AND 28-DAY SEGMENT CRUISES.

If time was standing in the way between you and our 6th annual 52-day Cruise Around South America, we've got big news for you. Two new, shorter cruises especially created for those who are short on time, but long for adventure.

Our 28-day cruise aboard the ss Britanis departs from Miami and cruises the Pacific coast of this magnificent continent. You'll explore such breathtaking places as Cristobal, the historic Panama Canal, Tierra del Fuego, Buenos Aires, and more! En route, you'll dine on Fantasy's wonderful cuisine, hear expert lecturers, and meet a group of like-minded travelers. All this, for as low as $3395!

Or try our 24-day cruise which starts at $2895 and joins up with us in Buenos Aires and cruises onward to explore the Atlantic coast and exotic beauty of Rio de Janeiro, the Orinoco River, Devil's Island, and more! And as always, our friendly, professional staff will ensure that your vacation is a "fantasy" in every sense of the word.

THERE'S NO EXCUSE TO MISS THE BOAT.

The value has never been better. Even our 52-day Cruise Around South America, from September 9 through October 31, is priced as low as $5995. That's as little as $116 a day! Plus, we have terrific rates for single travelers. Cabins are going fast. So, call your travel agent and book this adventure of a lifetime today. Or call **1-800-926-3800** (24 hours) and ask for our free brochure 7382.

Prices p.p. dbl. occ. min. accom. Segment prices include one-way air between Miami and Buenos Aires. Port charges $146-$228 p.p. Registry: Panama.

FANTASY CRUISES

CIRCUMNAVIGATION OF SOUTH AMERICA

Smithsonian

Board of Regents
Smithsonian Institution

Ex Officio

Chief Justice of the United States
William H. Rehnquist, Chancellor
Vice President of the United States
J. Danforth Quayle

Appointed by the President of the Senate

Hon. E. J. (Jake) Garn
Hon. Daniel P. Moynihan
Hon. James R. Sasser

Appointed by the Speaker of the House

Hon. Joseph M. McDade
Hon. Norman Y. Mineta
Hon. Jamie L. Whitten

Appointed by Joint Resolution of Congress

Hon. David C. Acheson
Hon. Anne L. Armstrong
Mrs. Jeannine Smith Clark
Mr. Ira Michael Heyman
Mr. Samuel C. Johnson
Dr. Homer A. Neal
Hon. R. James Woolsey

Smithsonian
National Board

Mr. Lloyd G. Schermer, Chairman
Mrs. Robert M. Bass
Mr. Joaquin F. Blaya
Mr. W. J. Bowen
Dr. John Brademas
Mr. Dan Burns
Mr. Cason J. Callaway jr.
Mrs. Cummins Catherwood jr.
Mr. Ivan Chermayeff
Mr. Landon T. Clay
Mrs. Dollie Cole
Mr. Thomas G. Cousins
Mrs. William H. Cowles III
Mrs. George C. Dillon
Mr. John Forsythe
Mr. Peter E. Haas
Mr. John M. Harbert III
Mr. Marion Edwyn Harrison
Mr. Frank W. Hoch
Mrs. A. William Holmberg
Mr. Robert V. Lindsay
Mrs. Jean B. Mahoney
Mr. Antony Merck
Mrs. Anne Murray Morgan
Mr. John W. Morrison
Dr. George E. Mueller
Mr. Thomas J. Pritzker
Mr. David S. Purvis
Mr. Alvin N. Puryear
Mr. Robert Redford
Mr. Clive Runnells
Mrs. Arthur M. Sackler
Mr. Leveo V. Sanchez
Dr. Ivan Selin
Mrs. E. Maynard Smith
Mr. A. Alfred Taubman
Mrs. Richard L. Thompson
Mr. Jeffrey N. Watanabe
Mr. T. Evans Wyckoff

Honorary Members

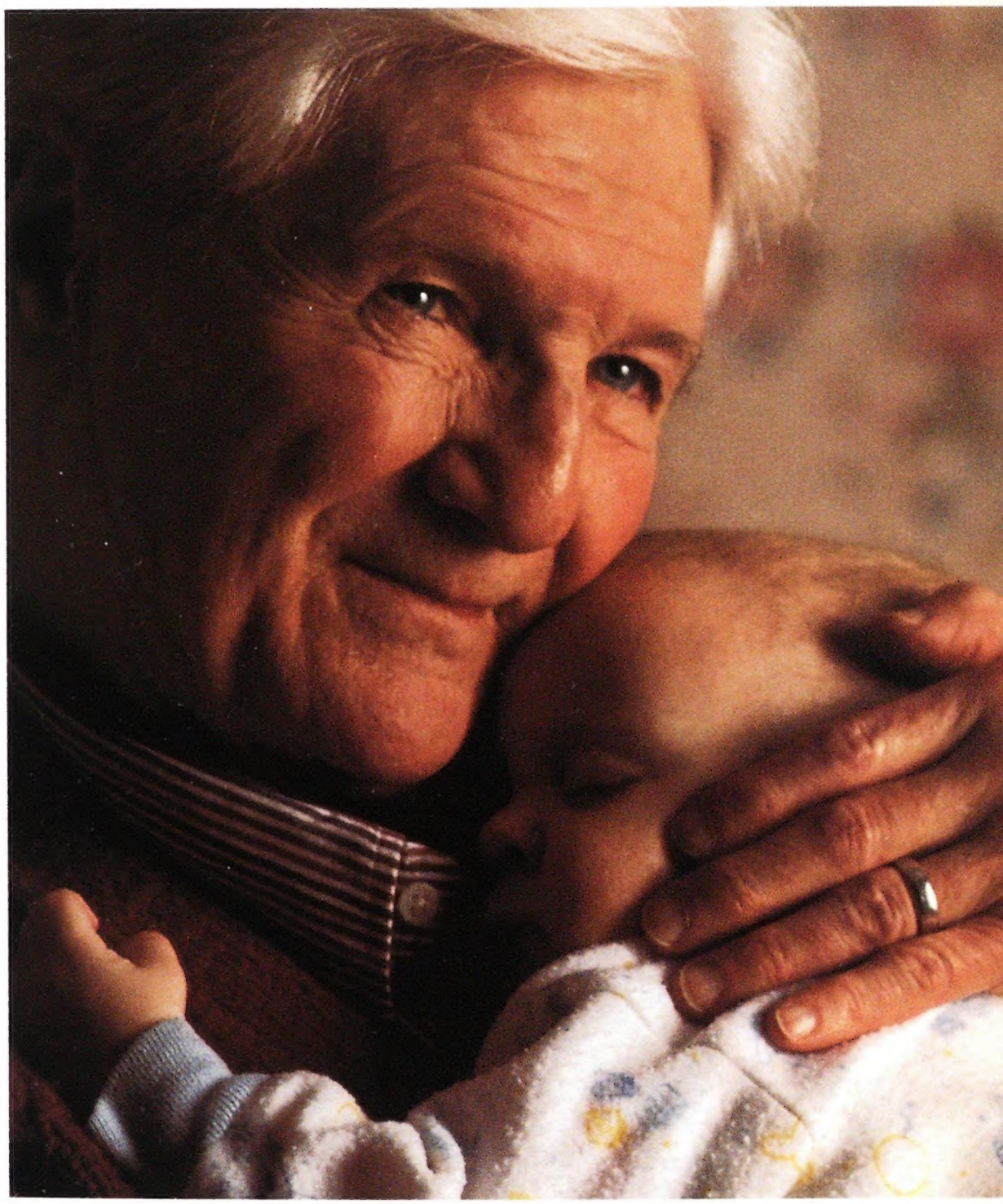
Mr. William S. Anderson
Mr. Richard P. Cooley
Mr. Joseph F. Cullman III
Mr. Charles D. Dickey jr.
Hon. Leonard K. Firestone
Mr. Alfred C. Glassell jr.
Mr. W. L. Hadley Griffin
Hon. William A. Hewitt
Mr. James M. Kemper jr.
Mr. Seymour H. Knox III
Mr. Lewis A. Lapham
Hon. George C. McGhee
Justice Sandra D. O'Connor
Mr. S. Dillon Ripley
Mr. Francis C. Rooney jr.
Hon. Thomas J. Watson jr.
Mrs. Gay F. Wray

How we help grand dads be grand dads longer.

With each passing decade, people have been able to hold onto more of life's rich moments.

In 1950, the average life span of men was 65. Today it's approaching 80, due in many ways to advances in medicine. At the forefront are pharmaceutical companies who are making the nation's largest investment in drug research.

We now have 329 medicines in test for 45 diseases of aging. These efforts always hold hope for breakthroughs. Yet the process is slow and difficult, with only a few of the thousands of compounds developed ever achieving success.



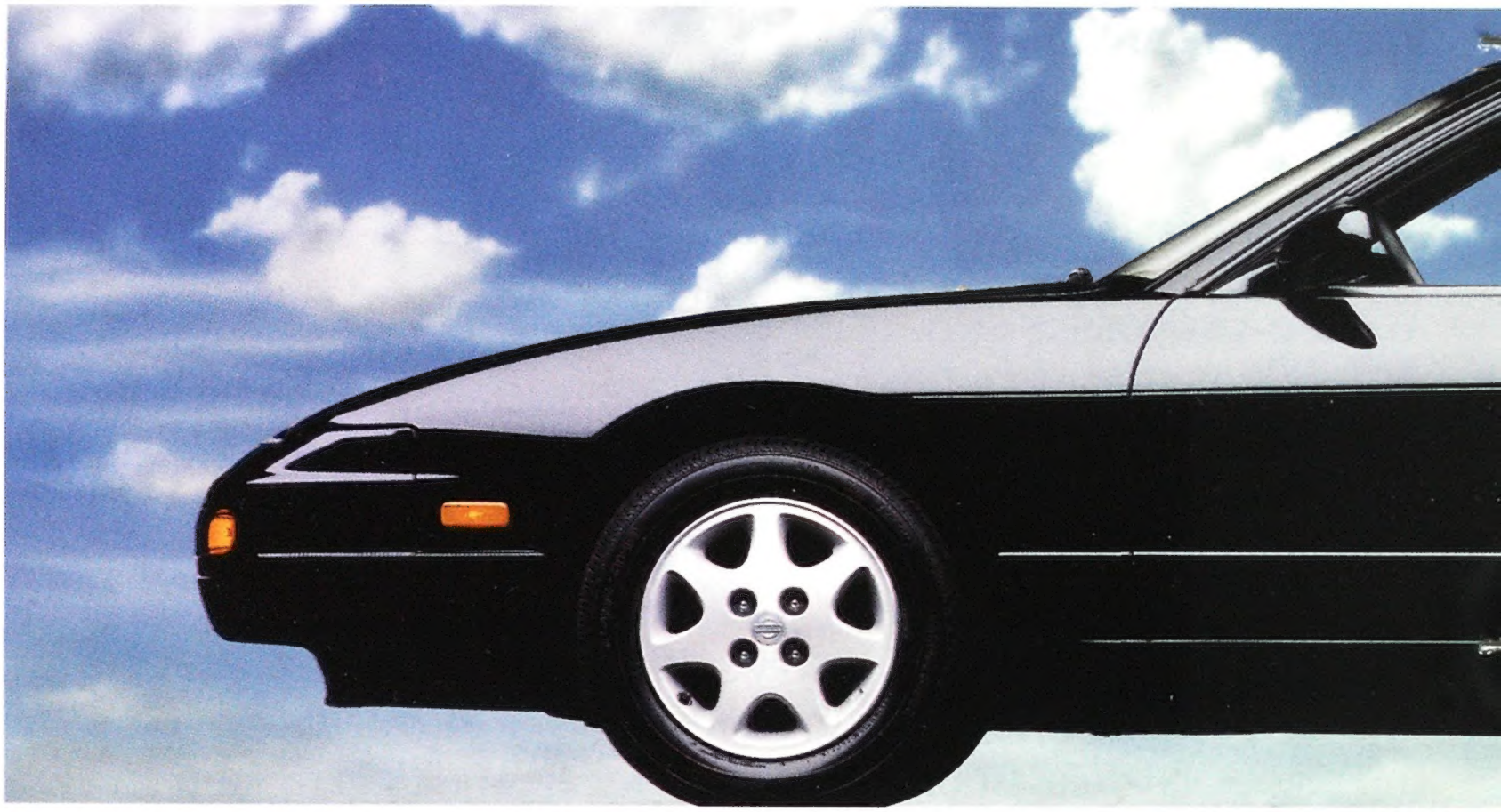
This exhaustive, high risk research increases the industry's cost of doing business, and in turn affects the price of drugs. But it also contributes to saving lives, while saving millions in health costs by eliminating or reducing the need for surgery, and shortening hospital stays.

To learn more about pharmaceutical research, and the critical role it plays in health care, call or write for our free booklet, "Good Medicine."

The Pharmaceutical Manufacturers Association, 1100 15th St., N.W., Box F, Wash., D.C. 20005. 1-800-538-2692.

PHARMACEUTICALS

Good Medicine For Containing Health Costs.



NISSAN

Nissan Motor Corporation in U.S.A. Smart people always read the fine print. And they always wear their seat belts.

IT COMES
EQUIPPED WITH AN
EASY TO OPEN,
AUTOMATIC,
DOUBLE INSULATED,
WRINKLE FREE,
FADE RESISTANT,
EXTREMELY SNUG
FITTING, INCREDIBLY
DURABLE CLOTH
TOP THAT
WILL PROBABLY
NEVER SEE
THE LIGHT OF DAY.

THE *NEW* LIMITED EDITION
240SX® CONVERTIBLE.

NISSAN

BUILT FOR THE HUMAN RACE.

Secretary Adams' comments

Smithsonian horizons

Zoos, no longer just places to entertain and educate the public, are now main players in the struggle to save wildlife

I doubt that we will ever know the full antiquity of zoos. The keeping and breeding of exotic wild animals can be unambiguously traced back at least to the middle of the third millennium B.C. in the Near East. Animal domestication had its beginnings a good many millennia earlier, and arguably would have been accompanied by much experimentation. Fully developed zoological gardens came later, providing delectation and sport for wealthy or imperial households. Their wide distribution, from Rome to China and in the pre-European New World as well, seems much more likely to reflect a common human impulse than the spread of a single idea.

Their more modern manifestations, traceable to mid-18th-century Vienna, quickly began to transcend the limitations of a fairly exclusive form of entertainment. Opening their doors to wider audiences, they kindled public curiosity about the wonders of the animal kingdom and took on an educative role. Some of them also became associated with early scientific studies of animal taxonomy and comparative anatomy.

There matters rested until quite recently. Zoos initially responded to narrowly human interests, in other words, whether for entertainment or for deeper understanding of the natural world. Hence it was not especially troubling that they closely resembled prisons, and that there were heavy casualties in finding the stock for them and maintaining them. Either ignored or rarely encountered was the criticism that they were a popular form of destructive parasite, especially upon the more exotic, less populous members of the animal kingdom.

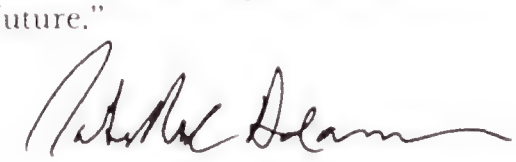
Some things in the world really do change for the better, and this is one of them. At least among our larger, more modern zoos, the accusation of parasitism is now wholly invalid. Organizations concerned with humane treatment of animals surely had a hand in this. So did advances in veterinary medicine, lengthening animal life spans and permitting departures from the harsh sterility of earlier cages. So also did the growing importance of animal reproduction and behavior studies, shedding new light on some of the crippling effects of severely constrained confinement.

But I believe the largest of all the forces for change was the growth of a sense of long-term stewardship for the small planet that we all inhabit. With rising concern for conservation has come an awareness of how close to the precipice of extinction we have already driven many species whose presence has enriched our lives and dominated our sense of the abundance of nature. As argued in a fine new study by Colin Tudge, *Last Animals at the Zoo: How Mass Extinction Can Be Stopped* (Hutchinson Radius, London, 1991), habitat destruction has already proceeded to the point where for some animals—"various rhinos, various subspecies of tiger, a growing list of primates, several cranes, many parrots, various reptiles"—conservation by breeding in zoos is our only feasible alternative. And not much less remote is the risk to various other species and subspecies of amphibians, fish, dogs, cats, bats and elephants.

The ultimate objective is, of course, to return these animals to unconstrained, natural settings as soon as such habitats can be established and made permanently safe. No one can say when a sustaining international order will be wholly in place, but some interim measures point to the practicality of the objective. The Smithsonian, for example, has played a leading part in the successful reintroduction of the golden lion tamarin into the coastal rain forests of Brazil. The Arabian oryx now is flourishing once again in the deserts of Oman. Still in the balance is the outcome of the very recent return of red wolves to the highlands of the Carolinas. "Each one poses a new problem. Each is precious, and time is short," writes Tudge.

Zoos are not the only means of attaining this end, but they are among the best. As controlled environments, they permit high rates of survival, measures to avoid disastrous inbreeding, and training to adapt zoo-bred animals to foraging under natural conditions. Not least, they are popular and hence can be economically self-sustaining. And make no mistake, any effort along these lines will need to be a prolonged and costly one. Tudge notes that some 2,000 species of land vertebrates will require maintenance, and that an effective breeding population of 500 or so of each will be necessary to preserve 90 percent of existing genetic variability for up to two centuries in order to avoid inbreeding.

Tudge compellingly concludes, as I would and as the Smithsonian's National Zoological Park splendidly exemplifies, that "the zoo—defined broadly—invents itself. If you protect animals (as is proper) and show them off to people (as is necessary to arouse public sympathy and to raise revenue) then you have, by definition, a zoo. . . . It will be part of civilised living for the foreseeable future."



After a close round of tennis, enjoy a round of caffeine free diet Coke®. *Just for the taste*

Caffeine Free diet Coke Trademarks ®

US OPEN

THE CHAMPIONSHIPS WIMBLEDON

Official Serve of the U.S. Open and Wimbledon.

100% NutraSweet product not available at fountain outlets. NUTRASWEET

Letters to the Editor

Grand Trunk Road

Dear Sir: Your May article took me back to the time when I lived just off the Grand Trunk Road, from 1920 to 1926. It was, in part, the road the British Army followed from Calcutta in 1857 on its march to the relief of Lucknow during the Indian Mutiny. There were monuments and campgrounds at intervals, where the troops had camped overnight. As their march progressed, the distance between campgrounds decreased daily.

In 1925, when we were 15, my friend Tommy Quinlan and I rode our bicycles north from Asansol to Benares, about 120 miles, camping at night in the memorial campsites. Tommy's father drove up to Benares to rescue us crazy youngsters for the return trip.
B. G. MacNabb
Cheyenne

Dear Sir: The dancing bear act, shown on page 112, is seen in many locations in India. A rope attached to the leash is threaded through the bear's nose. When the leash is pulled the bear "dances," trying to avoid the pain. This is inflicted over and over as the owner has the bear perform for almost every passing vehicle, hoping a driver will stop to take a picture and give a tip. It is a vicious practice that should be stamped out.
Bernard Shapiro
Philadelphia

Petticoat War

Dear Sir: When President Jackson decreed that Peggy Eaton was "chaste as a virgin, pure as the driven snow," his message was picked up by the opposition. Henry Clay, using a play on words from Shakespeare's *Antony and Cleopatra*, remarked, "Time cannot wither, nor custom stale her infinite virginity."
Duke Frederick
Cape Coral, Florida

Dear Sir: Peggy Eaton's two years of tribulation as wife of the territorial governor of Florida deserve mention.

Andrew Jackson sent John Eaton to that hinterland in 1834, mainly to get him away from the gossipmongers in Washington. At the time, Tallahassee was a frontier hellhole where duels and shoot-outs were regular occurrences. Gamblers plied their trade, and drunkenness was pervasive. But as Peggy Eaton was noted for her temper and ability to swear, the Eatons had no trouble adapting to a backwoods capital.

Robert Raymond Reid, later the territorial governor, described their advent in decidedly unkind terms. Tallahassee, he said, was "full of filth of all genders," adding, "Governor E. is a rowdy and his wife, drunk or crazy." Whether or not the lady was really as bad as her contemporaries believed, her sojourn in Florida failed to improve her reputation.

Eaton's gubernatorial career came to a merciful end in 1836 when the Eatons were sent off to Spain.
Jerry Blizin
Tarpon Springs, Florida

Bernard Loiseau

Dear Sir: In early 1952 my wife and I, driving to Geneva, reached the French town of Saulieu at lunchtime. I went into a modest structure to see if it was suitable. As there was a good crowd and the place looked very neat, I got my wife.

It immediately became apparent to the hostess that we spoke no French, so a lass of 10 or 12 who spoke English was summoned, and we were seated. My wife admired the fine damask, the crystal and silver. A bit overcome, I simply said to the girl, "We place ourselves in your hands."

There followed a memorable meal. A rich bisque; chicken in a sauce that I finished with a spoon; crisp salad. The house wine—superb. First-of-the-season *framboises.*

That evening I wrote our daughter that we had discovered an amazing restaurant in the little town, describing the meal in detail. A week later, her reply: "Silly goose. The Côte d'Or is one of France's most famous restaurants, one of only ten in the whole country to be honored by *Guide Michelin*'s three stars."

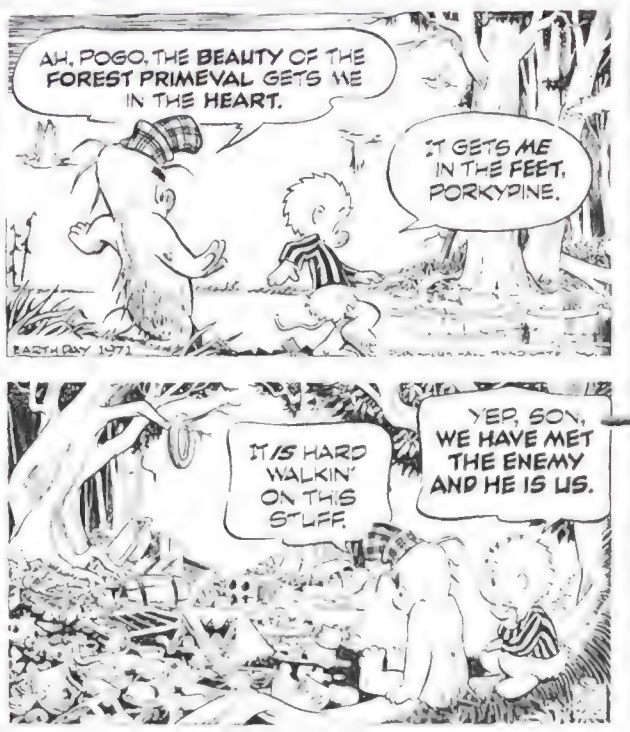
It is good that the Côte d'Or has regained the glory of M. Dumaine's day.
Carl M. Cleveland
Seattle

Porcupines

Dear Sir: In Walt Kelly's comic strip *Pogo*, the hero's unlikely partner Porkypine was there when Pogo declared, "We have met the enemy and he is us" [below].

Just for the record, those critters are not found in Pogo's Okefenokee Swamp.
Gregory T.M. Schildwachter
Knoxville, Tennessee

©Los Angeles Times Syndicate


AH, POGO, THE BEAUTY OF THE FOREST PRIMEVAL GETS ME IN THE HEART.
IT GETS ME IN THE FEET, PORKYPINE.
EARTH DAY 1971
IT IS HARD WALKIN' ON THIS STUFF.
YEP, SON, WE HAVE MET THE ENEMY AND HE IS US.

Dear Sir: The African crested porcupine may be prey for lions, but it would have to go to Asia to be eaten by a tiger. No tiger species is native to Africa.
Cheryl Dare
Memphis
The crested porcupine identified as "African" on page 54, is genus Hystrix, *found in Africa and also in India, Southeast Asia, southern Europe and, recently, Great Britain.* Ed.

Dear Sir: In 1926 a young Stanford graduate, Laura Webb, went to Nevada to edit a newspaper and married a gold miner, "Dutch" Bell. Her memoirs tell that their house was built into the slope of Buckskin Mountain, their bedroom window a few inches above the ground. She awoke one night with "something moving up my back outside the covers. It felt like little feet, stepping sedately. I twisted my neck to look, and seeing a

The answer is Sony.
Now what's the question?

Who makes it simple to play back directly on any TV?

One touch is all it takes
on a Handycam.

Why hassle with an adapter when you can play back your tapes directly on your television? Just plug your Handycam® camcorder into any TV and press "play." It's that easy.

Who lets you record five times longer than VHS-C?

30 MINUTES #1 VACATION '92 VHS-C
30 MINUTES #2 VACATION '92 VHS-C
30 MINUTES #3 VACATION '92 VHS-C
30 MINUTES #4 VACATION '92 VHS-C
30 MINUTES #5 VACATION '92 VHS-C
8 VACATION '92 SONY

2½ hours on 8mm

2½ hours on VHS-C

Some people bring home too many souvenirs from their vacation.

Sony Handycam camcorders give you 2½ hours of recording time on a single tape. VHS-C tapes last only 30 minutes.* Which means with a Handycam camcorder, you'll spend your time shooting tapes, not changing them.

Who delivers the finest picture and sound quality?

A Handycam camcorder picks up
what others can't touch.

The 8mm recording system takes full advantage of high density metal tape. So your home videos get the best clarity *and* hi-fi sound possible. In fact, Sony Handycam was chosen #1 by the leading consumer rating magazines.

Who has what it takes to really complete the picture?

Our Color Video Printer lets you catch a bee and hold it in your hand.

Now you can enjoy full color prints from your camcorder videos.

Simply find the exact moment you want, and the

Sony Color Video Printer will give you an amazing instant, instantly.

Who is America's most popular camcorder?

It's unanimous! More people choose

Sony Handycam camcorders than any other brand. And with

a great line-up of models to suit any need,

when the question is camcorders, there really is no contest.

Who has all the answers?
Without question.

SONY®

And who lets you save up to a grand on a grand vacation?

Just purchase any Sony Handycam camcorder or Video Walkman™ VCR/TV between June 1, 1992 and September 30, 1992 and you'll receive a discount certificate worth up to $1000 off the published tariff rate on selected Royal Caribbean Cruises to the Caribbean, Mexico or Bermuda. See your local authorized Sony dealer for details.

*In standard play mode.
Pictures simulated.
© 1992 Sony Corporation of America.
All rights reserved.
Sony, Handycam and Video Walkman™
are trademarks of Sony.

SONY

Sony Corporation of America
National Operations Headquarters
Sony Drive
Park Ridge, New Jersey 07656

blurred shape, poked Dutch, and whispered, 'There's something walking on my back.' "

After a sleepy look, Dutch sat up and yelled, "It's a damn porcupine!" Laura's journal continues: "The little feet stopped their progress . . . Dutch slid from under the covers and slowly rolled the bed on its swivel castors over to the open window. I felt the porcupine obligingly depart."

Next morning, wondering whether they had dreamed the encounter, they found "a single sharp quill on the windowsill."

Norman Bell
Santa Cruz, California

Arden

Dear Sir: In addition to the "dead Utopias" Henry Wiencek mentions, there is a very live one: Fairhope, Alabama.

Visiting this single-tax colony recently to see some of my friends, I was impressed with the same caring among the town's residents as at Arden. We had graduated in 1931 from the School of Organic Education, founded at Fairhope in 1907 by Marietta Johnson. One of the first progressive schools in this country, it was closely tied to the single-tax theory and embraced much of John Dewey's philosophy of education. The feeling of cooperation I enjoyed there has influenced my entire life profoundly and positively.

Hal Riegger
Gridley, California

Dear Sir: During my childhood in the 1920s and early '30s, my parents paid $500 for a house in Arden with an outdoor privy and spent the next 15 years improving it.

I recall the wonderful professional music accompanying Sunday vespers at the Gild Hall; one summer the Curtis String Quartet played, and there were many other fine musicians.

Marcus Aurelius Renzetti, who came from the tradition of Italian sculptors and stonecarvers, taught us things about sculpture that made its later enjoyment a part of my life. He was a wonderfully warm and patient teacher. The Hurlongs—he, a dentist—had outdoor fireside get-togethers that cast a spell on all of us. Buzz Ware, a commercial artist and clowning second baseman, and his wife, Jimmy, had a Saint Bernard big enough to pull a cart or give us children a ride. And near the Arden Forge was the Cooler, where one could get ice cream.

After the dirt roads were covered with cinders we learned to walk barefoot on them by day (hot), and with flashlights by night (dark)—there were no streetlights.

Every week the outdoor Woodland Theater had a different Shakespearean play. When the Robin Hood Theater opened in a barn in Ardentown, we had the good fortune in the late '40s to early '50s of seeing such budding talent as Anthony Perkins and Jack Klugman.

Norman L. Cannon, M.D.
Wilmington, Delaware

Dear Sir: As a classmate of Joe Renzetti's in Philadelphia early in the 1920s, I was a guest in the Arden cabin of his father, Aurelius. An ice house that had been made into the sculptor's studio and living quarters, it was on the Arden side of Naaman's Creek, a mile downstream from the Arden swimming pool, which we had helped create by building a dam of rocks and cement near the cabin.

Ernie Caesar
Philadelphia

Firefighters

Dear Sir: In such parts of the United States as the semiarid Southwest, water is never available in large quantities; elsewhere, as in California, drought greatly reduces its availability. My textbook *Introduction to Class A Foams and Compressed Air Foam Systems for the Structural Fire Service* points out that use of such foam (appropriate for Class A fires like wood, paper and plastic), especially in a compressed-air system, remarkably increases firefighter safety because it reduces exposure to heat, smoke and toxic gases. As it requires less water and extinguishes fires faster, it can put the Fire Service in the forefront of environmental protection.

John Liebson
Western Regional Director,
International Society of
Fire Service Instructors
Santa Fe

Smithsonian horizons

Dear Sir: Spanish historian Gregorio Marañón, in *Eulogy and Nostalgia of Toledo*, writes that in 1776 Cardinal Lorendana decided to rebuild El Alcázar, the palace of Toledo, as a home for "beggers and loafers," who had become an acute social problem. Seven hundred beggars who had roamed the Spanish roads were placed in the reconstruction—not to live a life of leisure but to work in the textile mills built within.

Gustavo J. Pellon
Atlanta

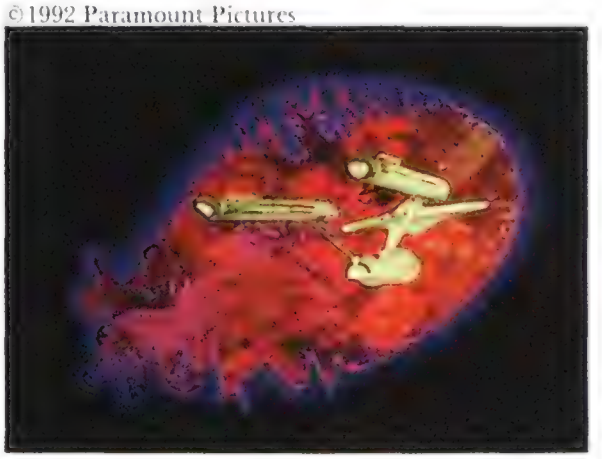
Highlights continued

Dear Sir: As a research zoologist at UCLA in late 1967, I got a telephone call from the *Star Trek* propman. He wanted me, as a protozoologist specializing in amoebas, to recommend a book that would show a large amoeba that might serve as a galactic amoeboid creature for a forthcoming episode in which the *Enterprise* would do combat with it.

I recommended Richard R. Kudo's fourth edition of *Protozoology*. Later, I saw the episode. The galactic amoeba [below] was a dead ringer for *Amoeba dubia* (now known as *Polychaos dubia*), as originally limned by Asa A. Schaeffer, an early 20th-century zoologist.

Eugene C. Bovee
Lawrence, Kansas

©1992 Paramount Pictures



Picture credits

Cover Peter Aaron/Esto Photographics; 26 Juan Delius; 30-31 Lynn Johnson/Black Star; 32 David Butow, Lynn Johnson; 33-37 Lynn Johnson; 38 David Butow; 40-41 Lynn Johnson; 44-55 Will van Overbeek; 58,59 Erica Lansmer/Black Star; 59 Keisuke Kumakiri; 60 Erica Lansmer/Black Star; 62 Richard Bryant/Arcaid; 64-65 Peter Aaron/Esto Photographics; 66-67 Yasuhiro Ishimoto; 70 Eduardo Fuss; 72,73 Dorothy Michele Novick; 74-79 Eduardo Fuss; 82-91 Charles Shaw/San Jacinto Museum of History in the San Jacinto Monument; 92,93 Arno Gasteiger; 94 David Matheson; 95 Kennedy Warne (top left), Arno Gasteiger (2); 96 Ian Plait; 97-101 Arno Gasteiger; 102 George Herben/AlaskaStock Images; 103 Rudy Schubert/Schubert Family Enterprises; 104 Steve Nelson/AlaskaStock Images, John Logan; 105 Rudy Schubert, Walter E. Mason; 106 Rudy Schubert; 107 Rudy Schubert, National Archives/Charles H. Phillips; 108-09 Jon Krakauer; 110,111 Alissa Crandall/AlaskaStock Images; 113-22 Margaret Scott; 128 Loel Barr

Jewelry shown actual size

55E Dreatm Catcher
Earrings $48
Pierced or Clipped

Sterling Silver
nd Gem Turquoise

The Set
for only
$68

To
Catch
a Dream . . .

The story of the Dream Catcher is one of the most beautiful in Indian mythology.

It is believed to have originated with the Oneida Indians in the northeastern part of the U.S.

A Dream Catcher was usually placed above a baby's cradleboard. The web of the Dream Catcher would filter all dreams and let only the good dreams flow through the open circle.

The Dream Catcher was kept throughout life and its power enhanced with fetishes and personal belongings.

PN Dream Catcher
endant $32

0" Sterling
hain included

end $2 for catalog

MARY LAURA'S
NATIVE AMERICAN JEWELRY

TO ORDER CALL TOLL FREE
1-800-662-4848
tl. (505) 242-5502 • Toll Free FAX 1-800-468-3236
Visa • Mastercard • American Express
POSTPAID
lary Laura's • (S) • 701 Carlisle Blvd. NE
ox 12615 • Albuquerque, NM 87195-2615 USA

Phenomena, comment and notes

In-flight musings lead to the verdict that our fine feathered friends are not as "birdbrained" as we thought

I was recently on a nonstop flight from Sydney, Australia, to Los Angeles—the ultimate in voluntary confinement and habitat deprivation. All the best efforts of the airline's in-flight entertainment, beverage and meal service, and efficient flight attendants could not prevent me from ultimately lapsing into depressive ennui. Even the latest Reginald Hill detective story, with Dalziel and Pascoe in full cry, did not stave off the doldrums. So, as always when boredom sets in, I slept.

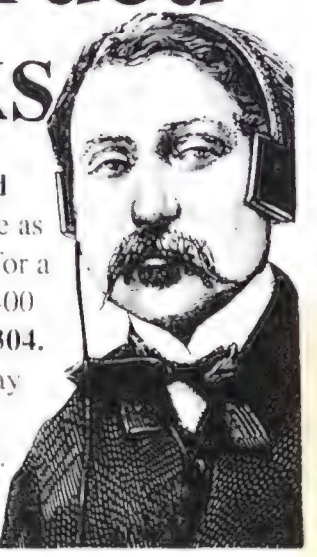
Every now and again I slipped into that state of reverie where thoughts creep in unannounced. I thought about birds and what *they* might think about on long flights. After all, some birds migrate from pole to pole; that's a lot farther than my boring flight. Is it "flap, flap, glide, look at the stars, check the mental compass, flap, flap, glide, adjust for that wind from starboard, oh my, this is boring"? Probably not. For birds, long-distance flying must be virtually automatic. Flapping, making trim adjustments, varying the wingtip slots, compensating for drift and other behaviors must be like our own mental involvement in swimming, surfing, driving, horseback riding or hang gliding, where conscious control is minimal once the learning stage is passed. Driving a car in city traffic is a fearsomely complex process, but while doing it we listen to music, sing along or even (in my case) "write" mental essays. Do birds fantasize while flying?

These thoughts were clearly wild or

The best underwear anywhere.

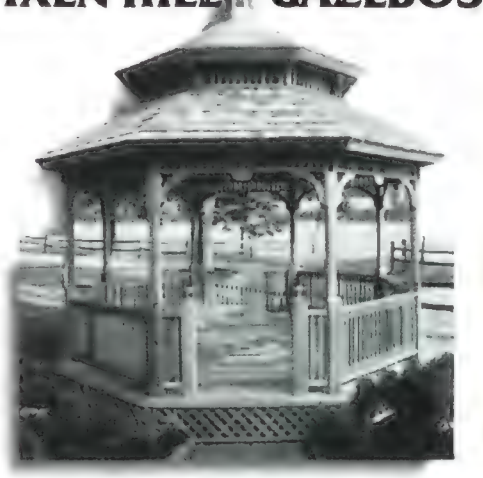
Boxers, briefs and undershirts. Finest quality, 100% cotton fabrics including Sea Island Cotton. Not sold in stores.
For exclusive catalog: THE GREEN POND COMPANY
Dept. 10 5060 Peachtree Rd., Atlanta GA 30505. 1-800-827-POND

Recorded Books



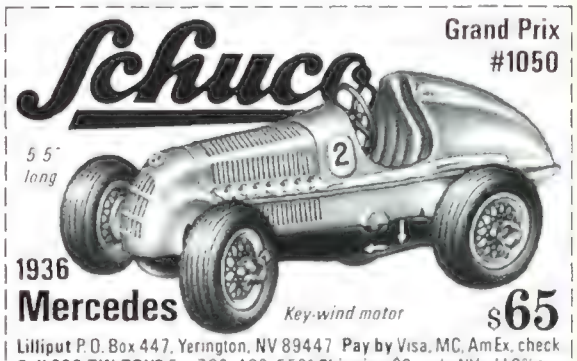
Listen to **unabridged** bestsellers on cassette as you drive. Call now for a free catalog of over 400 titles: **1-(800)-638-1304.** Ask about easy 30-day rentals by mail.
Recorded Books, Inc.
Box 409, Charlotte Hall, MD 20622

VIXEN HILL GAZEBOS



Discover our wide selection of architecturally authentic gazebos, pre-engineered for easy assembly by the non-carpenter. Send $3 for our 20-page color catalog.
Vixen Hill, Dept. SM-2, Elverson, PA 19520. 215-286-0909

Schuco Grand Prix #1050



1936 Mercedes Key-wind motor $65

Lilliput P.O. Box 447, Yerington, NV 89447 Pay by Visa, MC, Am Ex, check
Call 800-TIN-TOYS Fax 702-463-5581 Shipping $6 ea. In NV add 6% tax

12-DAY CRUISES FROM $99/DAY

Mayan Ruins • Jungle Rivers • Reef Snorkeling • Beach Landings • Fine Dining • Informal, Congenial Atmosphere

Belize • Great Barrier Reef • Guatemala Lakes • Cancun • Antigua-Grenada • Orinoco • Trinidad • Caracas • Florida Everglades • Dry Tortugas • Bahamas • Virgin Is. • Key West-New Orleans via Gulf Intracoastal • RI-FL via Atlantic Intracoastal • Canada Saguenay via Erie Canal • Maine Coast • NE Whale Watching

800-556-7450 for Free Brochure
American Canadian Caribbean Line, Inc.
28 Years of Small Ship Cruising Warren, RI 02885

perhaps delusional, but then I started thinking about intelligence in animals, cognition and consciousness. The epithet "birdbrain" is meant as condemnation; but are birds really stupid? Do they learn? Can they think? What about the size of the bird's brain?

The issue of brain size is not a simple one. For a start, most birds are small-brained because most birds are small. The physiology and mechanics of muscle-powered flight has restricted the size of birds. The biggest flying birds are soarers and gliders. The condors and albatrosses have very large wingspans compared with the passerines (perching birds). But even they are relatively small. The biggest birds with the biggest brains—but not the greatest mental capabilities—are the earthbound ratites: flightless striders and runners such as ostriches, rheas, cassowaries and kiwis.

When all is said and done, absolute brain size is not the measure of "braininess." Big bodies need more control tissue but not necessarily more thinking power. Thinking power makes for big brains in small bodies. The real test is the proportion of brain size to body mass (weight). Weight for weight, comparisons do index "intelligence." But even this kind of comparison can be misleading. Flying birds are built for lightness, with hollow bones and generally low-mass structural components. This skews the brain-body comparison in their favor. The flightless birds score lower than the flying birds on relative brain size. Flight-related lightness of structure in birds also affects comparisons with other vertebrates. Bearing in mind this positive bias, it is true that the brains of birds overlap those of many mammals, although not the primates.

Birds group with the mammals in their distinct separation from the fishes and reptiles. In proportion to body weight, the bird brain is 5 to 20 times larger than the reptile brain. Thus reptiles, successful as they are, rank distinctly lower than mammals and birds. "Fish-brain" and "lizard head" are much more appropriate derogatory epithets than "birdbrain."

The dinosaurs, from which the birds are descended, don't fare any better than other reptiles when it comes to brains. Some, of course, had huge masses of nerve tissue in the sacral (hip) region. Some wag claimed that this enabled them "to think *a posteriori* as well as *a priori*." However, the sacral nerve

NILE CRUISE & KENYA SPECIAL!
16 DAYS ONLY $1988
Includes airfare roundtrip from Europe to Africa, 7 day Nile cruise, 3 excursions in Kenya, hotel and all meals.
AFRICAN SAFARI CLUB • 1-800-544-0934 or your Travel Agt.
2170 S.E. 17th St. #303 Ft. Lauderdale, FL 33316

SCHOOL AT HOME
Kindergarten through Grade 8
- teach your child at home
- complete curriculum
- no experience necessary
- traditional, classical education
- accredited, nonprofit program
- advisory teachers available
- all materials included
- French and music courses
- send for free information

CALVERT SCHOOL
since 1906
Dept. S72, 105 Tuscany Road, Baltimore, MD 21210
(410) 243-6030 fax (410) 366-0674

One of America's Largest Fine Watch and Jewelry Discounters
SAVES YOU UP TO 50%
ROLEX • AUDEMARS • PATEK • BREITLING
BAUME & MERCIER • CARTIER, ETC.
DIAMONDS • PEARLS • PENS • CRYSTAL
815 Connecticut Ave. N.W.
Washington, D.C 20006
202/331-0671 800/654-7184
MARCUS & CO.
ELEGANT PRICE CUTTERS SINCE 1973
Free Shop at Home Catalogue

PERSONALIZED CARTOUCHE JEWELRY
Your name translated into Egyptian hieroglyphics.
HANDMADE IN EGYPT
Cartouche shown spells 'Charlotte'
18K Gold from $150
Sterling Silver $40
ORDER BY PHONE
1 (800) 447-2504
VISA • MC • AMEX • DISCOVER
For FREE BROCHURE Call or Write:
LITTLE EGYPT IMPORTS
4039 Broadway
Kansas City, MO 64111

When a loved one needs extended care for a psychiatric illness...
Consider the Greystone Program at Friends Hospital.

REPLACEMENTS, LTD.
A Million Pieces!
Active & Discontinued China, Crystal & Flatware.
To Buy or Sell:
Call (919) 697-3000, or write:
1089 Knox Rd. P.O. Box 26029, Dept. SM72A
Greensboro, NC 27420 (SASE Please)

THE METROPOLITAN MUSEUM OF ART

The perfect Christmas present from the Metropolitan Museum.

Shop by mail with our new 144-page catalogue of unusual and distinctive presents; most available *only* from the Museum. Jewelry, decorative works of art, sculpture, Christmas cards and ornaments, posters, art books, and a special selection of presents for children.

For your copy of the full-color catalogue send $1.00 to cover mailing.

2322

THE METROPOLITAN MUSEUM OF ART
255 Gracie Station
New York, NY 10028

Name_____
Address_____ Apt._____
City_____ State____ Zip_____

TRY A LITTLE Tenderness!

Try a package of thick, juicy, world-famous Omaha Steaks®. Luscious FILET MIGNONS, aged to tender perfection. Closely trimmed by hand. Delivered to your door, frozen under dry ice, in a reusable cooler. A FREE COOKBOOK inside. Your satisfaction is Unconditionally Guaranteed!

INTRODUCTORY OFFER...SAVE $22.00!

#469 6 (5 oz.) FILET MIGNONS, each 1" thick $29.95!

Regularly $51.95...for just

(plus $6.50 shipping/handling)

LIMIT OF 2 PKGS. AT THIS SPECIAL PRICE!

NEW CUSTOMERS ONLY, PLEASE.

OFFER (valid in 48 mainland states) EXPIRES 7/31/92

TO ORDER, CALL RIGHT NOW... TOLL FREE

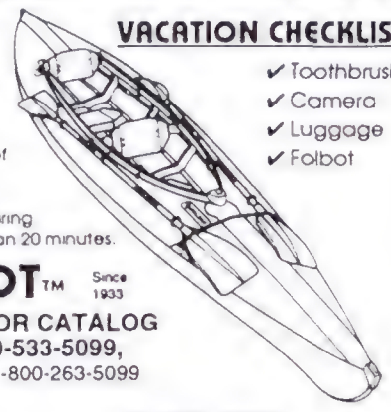
1•800•228•9055

(Ask for Free Catalog & 10% Discount Coupon!)

Omaha Steaks International®

Dept. AF2070 • P.O. Box 3300 • Omaha, NE 68103

VACATION CHECKLIST



Complete your vacation by taking your boat with you From 2 pieces of good-looking "luggage" to a rock-steady touring kayak in less than 20 minutes.

✔ Toothbrush
✔ Camera
✔ Luggage
✔ Folbot

FOLBOT™ Since 1933

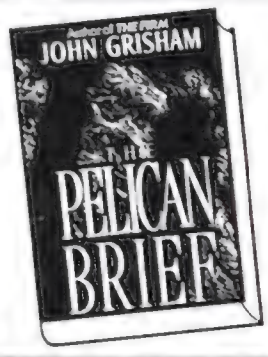
FREE COLOR CATALOG
CALL 1-800-533-5099,
IN CANADA 1-800-263-5099

or write.
Folbot, Inc
PO Box 70877, Dept SM
Charleston, SC 29415

FACTORY DIRECT
PRICES - SATISFACTION
GUARANTEED

BOOKS ON TAPE®

World's Largest Selection of Audio Books



• Best Sellers on Cassette
• Full-length Rentals
• Call for Free Brochure

Box 7900-S, Newport Beach, CA 92658

Reg.U.S.Pat.&T.M.Off.

(800) 626-3333

mass was probably responsible for the control of the hindparts, distant from the head, and not for higher functions. It would be fun, though, if we could accept the possibility of dinosaurian afterthoughts. For all these reasons, alas, as an insult "birdbrained" does not stand the biological test. The avian brain is not of inferior relative size. Or at least it passes muster for relative size compared with rabbits, cats, dogs and other nonprimates.

Certain families of birds are distinguished by their lower-than-average brain-body ratio. Ostriches, gallinaceous birds (chickens and the like) and pigeons have the lowest relative brain weights, while the parrot and crow families score high. No wonder the raven quoth "Nevermore."

But what about brains in the sense of "brightness," "intelligence" or "cleverness"? All these terms have an immediate meaning for us but are extraordinarily difficult to define. If called upon to define them most of us would quote examples. We would refer to people or behaviors that exemplify the possession of these attributes or define their opposites. "Stupidity" is a good catchall opposite. For most of us it is an inability to solve problems or to learn.

In practical terms, for most people, stupidity is exemplified in inflexible persistence in inappropriate courses of behavior. When I try to open the almost identical door of the apartment on the floor vertically below mine, that is unthinking behavior. If I persist and then kick the door down, that is stupidity. If I examine the door and realize my mistake, that is intelligence. This is an operational definition.

Are birds stupid? Most definitely not. They have some quite remarkable learning abilities. My friend Juan Delius, an ethologist with a strong interest in both neurophysiology and experimental psychology, has spent much of his life studying the ability of pigeons to learn complex discriminations and solve problems. One of his discoveries is that pigeons can be taught to distinguish bilaterally symmetrical patterns from bilateral images that are nonsymmetrical. After conditioning they can distinguish between patterns that they have never seen before, when the only variable is in symmetry. Abandoning scientific caution, one could conclude that during the training the birds had developed a "concept" of symmetry. Cer-

LEATHER BACKPACK RUGGED ONLY $29.95

HISTORIC EXPLORERS of America required backpacks that were tough! Now YOU can enjoy the richness (smell that leather) and durability of soft, 100% leather in this modern version of the famous trail pack of yesteryear. Rich tan color. Black metal hardware. Roomy 14" x 17" x 6" cargo compartment plus 3 handy expandable outside pockets. Two 2" wide adjustable shoulder straps. Excellant bookbag. Offers 1,000 uses for any outdoorsman and a touch of class for those "long hours on the trail." Send $29.95 + $3.95 delivery. Use 30 days, money back if not pleased. MasterCard & Visa accepted (phone 312-445-6166). C.O.D. require $5 deposit. Order today! Midwest Company, Dept L-3319, 9243 S. [illegible] Chicago, IL 60620. Special 2 packs for $58.90 [illegible]

BONUS: ORDER NOW
RECEIVE A COMPASS FREE

What's in Turkey?

The Cradle of Civilization . . .

Did you know that the tulip comes from Turkey?
That Philadelphia is in Turkey?
That the cherry comes from Turkey?
That St. Nicholas was born, lived & died there?
That two of the world's wonders are there?
That many major civilizations lived there?

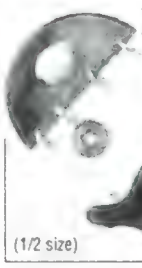
Bora Özkök's CULTURAL TOURS TO TURKEY

We will stress cities, villages, culture, folklore, handicrafts, folk music & folk dance. We will enjoy the natural beauty, history, many ancient monuments and museums with enough time for great photography. Good hotels, delicious Turkish cuisine, great shopping. Experienced tour guides & leaders.

Reasonable rates. . .Great quality.

For a free brochure:

Bora Özkök - Cultural Folk Tours Int'l
9939 Hibert St., Ste. 207 619-566-5951
San Diego, CA 92131,1031 1-800-448-0515



FOSSIL PIN - Signed by artist Kris Perry
Shark's tooth, crinoid, ammonite & trilobite fossils, sterling silver with choice of turquoise or garnet - 10 day approval
$145 ppd. VISA/MC/DISC/CK/MO
- Send for FREE catalog!

NATURE GALLERY OF CALIFORNIA
844 Monterey, San Luis Obispo
CA 93401 1-800-348-8876

(1/2 size)

HIEROGLYPHS

PERSONALIZED CARTOUCHE JEWELRY

SS Pendants from $40 • 18k from $150

Handmade in Egypt • Free Brochure has Alphabet
8 Pendant Styles • 6 Ring Styles
Bracelets • Earrings

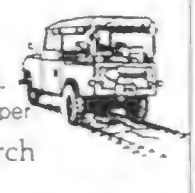
1-800-237-3358

Discoveries 207 Ramsay Alley, Alexandria, Virginia 22314

CELEBRATING OUR 12TH YEAR!

Cartouche spells 'Dan with Man symbol

SCIENTIFIC EXPEDITIONS



To join in archaeology and wildlife research, request our 44-page newspaper

Foundation for Field Research
P.O. Box 2010
Alpine, CA 91903-2010 (619) 445-9264

日本刀 JAPANESE SWORDS

For Free Evaluation Sheet

TOLL FREE 800-435-5119

$200 $250,000 CASH PAID

French Art Glass (Galle, Daum), Tiffany Lamps Also Wanted

David E. J. Pepin—Member NBTHK, Tokyo, Japan
Dept. SI, P.O. Box 354, Grant Park, IL 60940

Can you tell who's wearing the nitroglycerin patch?

The truth is both are. The twin on the right is wearing Transderm-Nitro®. The twin on the left is wearing Minitran—the smallest, thinnest, most transparent nitroglycerin patch.

When asked about such product features as size, transparency and adhesion, patch wearers preferred Minitran more than 2 to 1 over Transderm-Nitro and Nitro-Dur®.[1] There's one more thing to like—Minitran should cost less than your current brand.[2]

Want to know more about Minitran? Ask your doctor or pharmacist, or call 1-800-3M-ANSWERS (1-800-362-6793).

All transdermal nitroglycerin products are being marketed pending final evaluation of effectiveness by the FDA.

Please see adjacent page for summary of prescribing information.

MINITRAN™
(nitroglycerin)
TRANSDERMAL DELIVERY SYSTEM
0.1 MG/HR, 0.2 MG/HR, 0.4 MG/HR, 0.6 MG/HR

The small wonder.

Innovation working for you™

3M Pharmaceuticals
3M Health Care
St. Paul, Minnesota 55144-1000

3M

If you would like a large, easy-to-read version of the information below, call 1-800-3M-ANSWERS (1-800-362-6793).

MINITRAN
(nitroglycerin)

BRIEF SUMMARY

INDICATIONS AND USAGE

This drug product has been conditionally approved by the FDA for the prevention of angina pectoris due to coronary artery disease. Tolerance to the anti-anginal effects of nitrates (measured by exercise stress testing) has been shown to be a major factor limiting efficacy when transdermal nitrates are used continuously for longer than 12 hours each day. The development of tolerance can be altered (prevented or attenuated) by use of a noncontinuous (intermittent) dosing schedule with a nitrate-free interval of 10–12 hours

Controlled clinical trial data suggest that the intermittent use of nitrates is associated with decreased exercise tolerance, in comparison to placebo, during the last part of the nitrate-free interval; the clinical relevance of this observation is unknown, but the possibility of increased frequency or severity of angina during the nitrate-free interval should be considered. Further investigations of the tolerance phenomenon and best regimen are ongoing. A final evaluation of the effectiveness of the product will be announced by the FDA.

CONTRAINDICATIONS: Allergic reactions to organic nitrates are extremely rare, but they do occur. Nitroglycerin is contraindicated in patients who are allergic to it. Allergy to the adhesives used in nitroglycerin patches has also been reported, and it similarly constitutes a contraindication to the use of this product. **WARNINGS:** The benefits of transdermal nitroglycerin in patients with acute myocardial infarction or congestive heart failure have not been established. If one elects to use nitroglycerin in these conditions, careful clinical or hemodynamic monitoring must be used to avoid the hazards of hypotension and tachycardia. A cardiovertor/defibrillator should not be discharged through a paddle electrode that overlies a MINITRAN patch. The arcing that may be seen in this situation is harmless in itself, but it may be associated with local current concentration that can cause damage to the paddles and burns to the patient. **PRECAUTIONS:** General: Severe hypotension, particularly with upright posture, may occur with even small doses of nitroglycerin. This drug should therefore be used with caution in patients who may be volume depleted or who, for whatever reason, are already hypotensive. Hypotension induced by nitroglycerin may be accompanied by paradoxical bradycardia and increased angina pectoris. Nitrate therapy may aggravate the angina caused by hypertrophic cardiomyopathy. As tolerance to other forms of nitroglycerin develops, the effect of sublingual nitroglycerin on exercise tolerance, although still observable, is somewhat blunted. In industrial workers who have had long-term exposure to unknown (presumably high) doses of organic nitrates, tolerance clearly occurs. Chest pain, acute myocardial infarction, and even sudden death have occurred during temporary withdrawal of nitrates from these workers, demonstrating the existence of true physical dependence. Several clinical trials in patients with angina pectoris have evaluated nitroglycerin regimens which incorporated a 10–12 hour nitrate-free interval. In some of these trials, an increase in the frequency of anginal attacks during the nitrate-free interval was observed in a small number of patients. In one trial, patients demonstrated decreased exercise tolerance at the end of the nitrate-free interval. Hemodynamic rebound has been observed only rarely; on the other hand, few studies were so designed that rebound, if it had occurred, would have been detected. The importance of these observations to the routine, clinical use of transdermal nitroglycerin is unknown. **Information for Patients:** Daily headaches sometimes accompany treatment with nitroglycerin. In patients who get these headaches, the headache may be a marker of the activity of the drug. Patients should resist the temptation to avoid headaches by altering the schedule of their treatment with nitroglycerin, since loss of headache may be associated with simultaneous loss of anti-anginal efficacy. Treatment with nitroglycerin may be associated with lightheadedness on standing, especially just after rising from a recumbent or seated position. This effect may be more frequent in patients who have also consumed alcohol. After normal use, there is enough residual nitroglycerin in discarded patches that they are a potential hazard to children and pets. A patient leaflet is supplied with the systems. **Drug Interactions:** The vasodilating effects of nitroglycerin may be additive with those of other vasodilators. Alcohol, in particular, has been found to exhibit additive effects of this variety. **Carcinogenesis, Mutagenesis, and Impairment of Fertility:** No long-term animal studies have examined the carcinogenic or mutagenic potential of nitroglycerin. Nitroglycerin's effect upon reproductive capacity is similarly unknown. **Pregnancy Category C:** Animal reproduction studies have not been conducted on nitroglycerin. It is also not known whether nitroglycerin can cause fetal harm when administered to a pregnant woman or whether it can affect reproductive capacity. Nitroglycerin should be given to a pregnant woman only if clearly needed. **Nursing Mothers:** It is not known whether nitroglycerin is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when nitroglycerin is administered to a nursing woman. **Pediatric Use:** Safety and effectiveness in children have not been established. **ADVERSE REACTIONS:** Adverse reactions to nitroglycerin are generally dose-related, and almost all of these reactions are the result of nitroglycerin's activity as a vasodilator. Headache, which may be severe, is the most commonly reported side effect. Headache may be recurrent with each daily dose, especially at higher doses. Transient episodes of lightheadedness, occasionally related to blood pressure changes, may also occur. Hypotension occurs infrequently, but in some patients it may be severe enough to warrant discontinuation of therapy. Syncope, crescendo angina, and rebound hypertension have been reported but are uncommon. Extremely rarely, ordinary doses of organic nitrates have caused methemoglobinemia in normal-seeming patients. Methemoglobinemia is so infrequent at these doses that further discussion of its diagnosis and treatment is deferred (see **Overdosage**). Application-site irritation may occur but is rarely severe. In two placebo-controlled trials of intermittent therapy with nitroglycerin patches at 0.2 to 0.8 mg/hr, the most frequent adverse reactions among 307 subjects were as follows:

	placebo	patch		placebo	patch
headache	18%	63%	hypotension and/or syncope	0%	4%
lightheadedness	4%	6%	increased angina	2%	2%

OVERDOSAGE: Hemodynamic Effects: The ill effects of nitroglycerin overdose are generally the results of nitroglycerin's capacity to induce vasodilatation, venous pooling, reduced cardiac output, and hypotension. These hemodynamic changes may have protean manifestations, including increased intracranial pressure, with any or all of persistent throbbing headache, confusion, and moderate fever; vertigo; palpitations; visual disturbances; nausea and vomiting (possibly with colic and even bloody diarrhea); syncope (especially in the upright posture); air hunger and dyspnea, later followed by reduced ventilatory effort; diaphoresis, with the skin either flushed or cold and clammy; heart block and bradycardia; paralysis; coma; seizures; and death. Laboratory determinations of serum levels of nitroglycerin and its metabolites are not widely available, and such determinations have, in any event, no established role in the management of nitroglycerin overdose. No data are available to suggest physiological maneuvers (e.g., maneuvers to change the pH of the urine) that might accelerate elimination of nitroglycerin and its active metabolites. Similarly, it is not known which – if any – of these substances can usefully be removed from the body by hemodialysis. No specific antagonist to the vasodilator effects of nitroglycerin is known, and no intervention has been subject to controlled study as a therapy of nitroglycerin overdose. Because the hypotension associated with nitroglycerin overdose is the result of venodilatation and arterial hypovolemia, prudent therapy in this situation should be directed toward increase in central fluid volume. Passive elevation of the patient's legs may be sufficient, but intravenous infusion of normal saline or similar fluid may also be necessary. The use of epinephrine or other arterial vasoconstrictors in this setting is likely to do more harm than good. In patients with renal disease or congestive heart failure, therapy resulting in central volume expansion is not without hazard. Treatment of nitroglycerin overdose in these patients may be subtle and difficult, and invasive monitoring may be required. **Methemoglobinemia:** Nitrate ions liberated during metabolism of nitroglycerin can oxidize hemoglobin into methemoglobin. Even in patients totally without cytochrome b_5 reductase activity, however, and even assuming that nitrate moieties of nitroglycerin are quantitatively applied to oxidation of hemoglobin, about 1 mg/kg of nitroglycerin should be required before any of these patients manifests clinically significant (≥10%) methemoglobinemia. In patients with normal reductase function, significant production of methemoglobin should require even larger doses of nitroglycerin. In one study in which 36 patients received 2–4 weeks of continuous nitroglycerin therapy at 3.1 to 4.4 mg/hr, the average methemoglobin level measured was 0.2%; this was comparable to that observed in parallel patients who received placebo. Notwithstanding these observations, there are case reports of significant methemoglobinemia in association with moderate overdoses of organic nitrates. None of the affected patients had been thought to be unusually susceptible. Methemoglobin levels are available from most clinical laboratories. The diagnosis should be suspected in patients who exhibit signs of impaired oxygen delivery despite adequate cardiac output and adequate arterial pO_2. Classically, methemoglobinemic blood is described as chocolate brown, without color change on exposure to air. When methemoglobinemia is diagnosed, the treatment of choice is methylene blue, 1–2 mg/kg intravenously **DOSAGE AND ADMINISTRATION:** The suggested starting dose is between 0.2 mg/hr* and 0.4 mg/hr*. Doses between 0.4 mg/hr* and 0.8 mg/hr* have shown continued effectiveness for 10–12 hours daily for at least one month (the longest period studied) of intermittent administration. Although the minimum nitrate-free interval has not been defined, data show that a nitrate-free interval of 10–12 hours is sufficient. Thus, an appropriate dosing schedule for nitroglycerin patches would include a daily patch-on period of 12–14 hours and a daily patch-off period of 10–12 hours. Although some well-controlled clinical trials using exercise tolerance testing have shown maintenance of effectiveness when patches are worn continuously, the large majority of such controlled trials have shown the development of tolerance (i.e., complete loss of effect) within the first 24 hours after therapy was initiated. Dose adjustment, even to levels much higher than generally used, did not restore efficacy. **STORAGE CONDITIONS:** Store at controlled room temperature 15°–30°C (59°–86°F). Extremes of temperature and/or humidity should be avoided. **CAUTION:** Federal law prohibits dispensing without prescription.

*Release rates were formerly described in terms of drug delivered per 24 hours. In these terms, the supplied MINITRAN systems would be rated at 2.5 mg/24 hours (0.1 mg/hr), 5 mg/24 hours (0.2 mg/hr), 10 mg/24 hours (0.4 mg/hr), and 15 mg/24 hours (0.6 mg/hr)

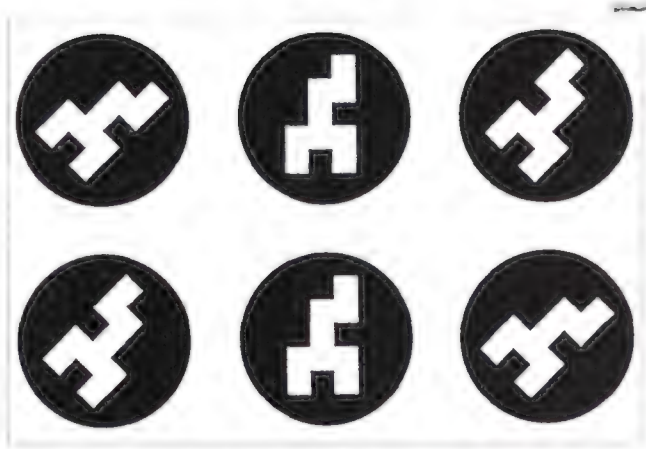
3M Pharmaceuticals
Northridge, CA 91324 NTR-6BS JUNE 1991

REFERENCES: 1. Hougham AJ, Hawkinson RW, Crowley JK, et al. *Clin Ther.* 1989;11(1):15–31. **2.** Pharmaceutical Data Services; Scottsdale, AZ; Jan 1992. Retail pricing may vary from community to community and may affect cost savings to the patient. Transderm-Nitro is a registered trademark of Ciba Pharmaceutical Co; Nitro-Dur, of Key Pharmaceuticals, Inc
Minitran is not available in Canada and Mexico.

© 3M Pharmaceuticals — 1992 2300-17263MP-SM

3M Pharmaceuticals
3M Health Care
St. Paul, Minnesota 55144-1000

3M



When given shape such as that shown in center of each horizontal row, trained pigeons are able to rapidly distinguish its rotated twin from a mirror image.

tainly Delius uses the word in this connection. To me that suggests a quite complex degree of cleverness. The ability to form concepts is surely a hallmark of intelligence.

Delius and his coworkers also found that pigeons can be taught to solve inversion problems faster and more reliably than many humans can. Inversion problems are those that involve recognizing a complex figure when it is inverted (or rotated) and distinguishing it from its similarly inverted mirror image. Thus the letter *E* can be rotated through 45, 90 and 180 degrees before returning to its normal orientation. We can quickly recognize these inversions from the back-to-front *E*. However, we have much more difficulty in spotting inversions of unfamiliar objects. Test yourself using the illustration above. Trained pigeons can do these tasks quickly and reliably. In real life it must be useful for a pigeon to recognize its loft from whatever angle it may see it as it navigates homeward. Navigation is another function of the pigeon brain involving complex powers of computation—but that is another story. There seems little doubt that some birds have an unnamed number concept. They can count, at least up to seven. Erle Stanley Gardner, prolific creator of Perry Mason, titled one of his detective stories *Crows Can't Count*, but they can. (Look for it under Gardner's pseudonym "A. A. Fair.")

Many birds do many things with minimal learning. They seem to be hard-wired to fly, build nests and so on. Complex learning has been recognized, however, in a wide variety of circumstances ranging through singing, parent recognition, chick recognition, mate recognition and species recognition.

READ THE CLASSICS.

They are timeless. And always in style, but never trendy. Their quality is, shall we say, inherent.

That just about covers everything in a Lands' End Catalog.

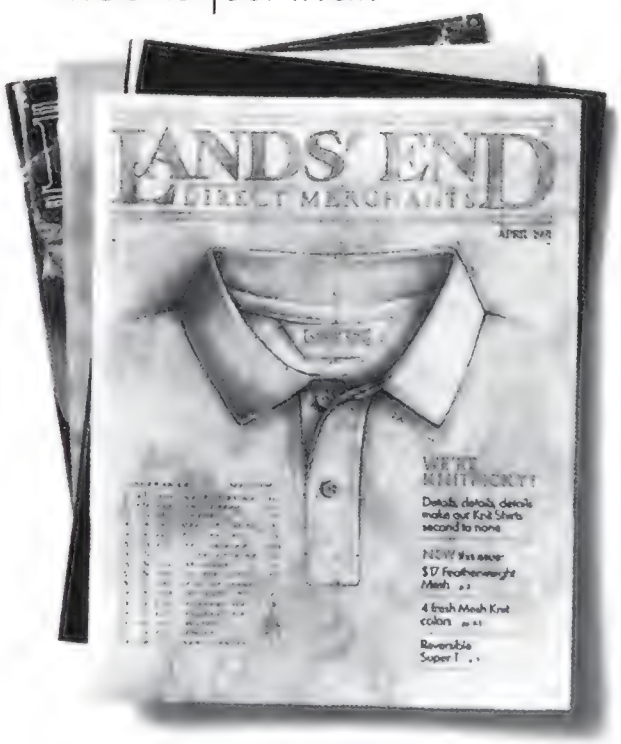
Page after page (more than 200 in some of our catalogs), you will discover the best values anyone can possibly get. Anywhere.

We know the people well who make our goods. And we constantly work with them to improve the quality of each item. We try hard to keep it simple and straightforward.

We feel the same way about our customers, too. It's like selling something to a friend. So we want you to be completely satisfied.

If for any reason you're not completely happy with anything you buy from us, send it back. We'll refund your money. That's it. No stalling. No nothing. Your money back. Immediately.

We call our guarantee Guaranteed. Period®. And it means just that.



It also sets the tone for everything else we do at Lands' End. If you need new shoelaces or buttons for a Lands' End item, just call us. We send them to you free. Want fabric swatches for a sportscoat or towel? You get them. Again, free.

And speaking of what we sell, you will find our catalogs filled with classic and casual clothes for men, women and children. You will find soft luggage and furnishings for your home.

You can call Lands' End any day, any time. We're always there. You will hear a friendly voice who knows our products and how to be helpful. Should you have a special question about sizing, wardrobe matching, whatever, we'll be happy to give you an answer.

And best of all, we will quickly fill your order and send it on its way to you within 24 hours after you've called us.

Please don't forget, a classic education begins with one of our catalogs.

Please send a free catalog.

Lands' End, Dept. **BC-B7**
Dodgeville, Wisconsin 53595

Name_____

Address _____ Apt. _____

City _____ State _____ Zip _____

Guaranteed Period.®

LANDS' END DIRECT MERCHANTS

A CELEBRATION OF PLANET EARTH.

"Our greatest challenge in the next century and beyond, will be to learn to live more harmoniously with our fellow creatures and to redefine our place within the complex systems that govern our earthly home." John Williams

JOHN WILLIAMS AND THE BOSTON POPS ORCHESTRA "THE GREEN ALBUM"

Explore music of natural beauty with award-winning conductor John Williams and The Boston Pops Orchestra. "The Green Album" brings a fresh approach and new meaning to such classics as Woody Guthrie's This Land Is Your Land, Aaron Copland's Simple Gifts, and new material including Theme For Earth Day.

John Williams and The Boston Pops Orchestra, "The Green Album." Exclusively on Sony Classical. Executive Producer & Producer: Thomas Z. Shepard

Also available:

SONY MUSIC IS OUR VISION

"Sony Classical" are trademarks of Sony Corporation ©1992 Sony Classical GmbH

Available at:

TOWER RECORDS | VIDEO

or call 1-800-648-4844

Some bird species learn song dialects but not the basic patterns of the songs, their basic "tunes." Among the song learners there are species that learn dialects when young and do not use them until they are mature. There is good evidence that some gull species learn the personal call of their parents while they are still developing in the egg. Playing recorded birdcalls to incubating eggs has proved this.

Even more interesting is the phenomenon of imprinting. Many ducklings and goslings learn to recognize their parents (and their species' characteristics) in a short period of intensive learning while very young. This is an economical and efficient process. Such imprinting works well in nature because the young birds respond to the appropriate objects, their parents. Human interference, however, can produce a totally inappropriate response. A young goose can be provided with a proximal nongoose to follow and imprint upon. Goslings will imprint on crouching, quacking and waddling humans, and follow them around as if they were geese. Such imprinting on a pseudoparent may affect the animal long after its infancy. The bizarre result may be that when the gosling becomes a goose or gander, it may make sexual advances to humans rather than to its own species (SMITHSONIAN, April 1990). We wise humans might dismiss such behavior as stupid, but it is really a pointed example of learning that is tailored to natural needs and is not profligate or energetically wasteful.

Returning to my in-flight musings, birds may or may not fantasize, but they certainly do not deserve condemnation for their brains. There's a piece of doggerel: "Happy little moron, doesn't give a damn. / Thankfully I'm not a moron; oh dear, perhaps I am!" We should think about our own capacities and recognize that we are blind to many of our inadequacies. Would we, or could we, know if there were some parts of our behavior that were unalterable by learning? I doubt it. Or what if, for some kinds of learning, there were a sensitive period after which we were imprinted, doomed forever to respond to an irrelevant stimulus? We may discover our limitations only by studying our cohabitants of this planet that we disregard and mutilate so often.

Michael H. Robinson
Director, National Zoological Park

OWN A PIECE OF HISTORY

We deal in original letters and documents written by famous people. Americans, World Leaders, Scientists, Authors, Artists, Composers and many more.

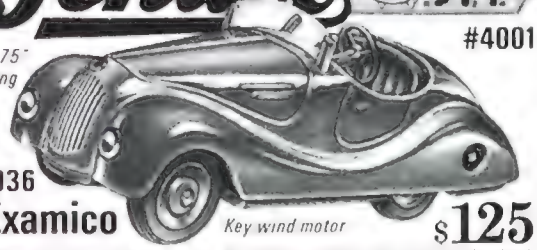
Call toll-free or send $2 for our catalogue today.

Please include phone number and individuals of interest

A. Lincoln

American Historical Guild
130 Circle Drive, Suite 200
Roslyn Heights, N.Y. 11577
(516) 621-3051 • 800-544-1947

Schuco w/Gearshift #4001
5 75" long



1936 Examico Key wind motor $125
Lilliput P.O. Box 447, Yerington, NV 89447 Pay by Visa, MC, AmEx, check.
Call 800-TIN-TOYS Fax 702-463-5581 Shipping $6 ea. In NV add 6% tax.

Breakell Silversmiths

THE SEAGULL bracelet, created by Newport Silversmith James Breakell, captures the grace and beauty of a seagull in flight. In Sterling $35, in 14K gold $265. In RI add 6% tax. Add $3.50 handling. Call 1-800-767-6411. VISA/MC/AMEX. Send $2.00 for our new color catalog.

69 MILL STREET, DEPT. S05, NEWPORT, RI 02840

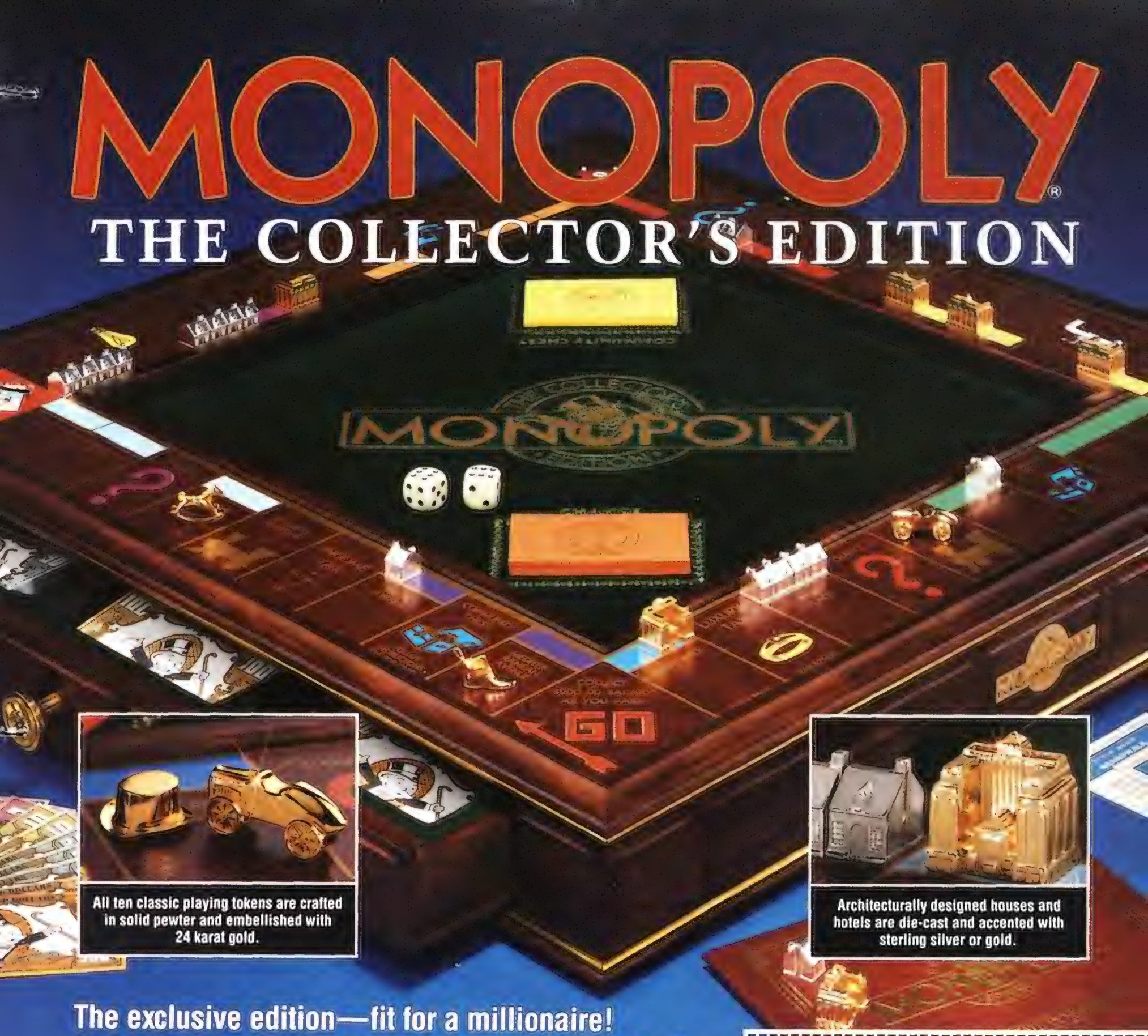
COPPER CANYON
SIERRA MADRE RAIL EXCURSIONS

Dramatic train ride to a canyon larger than the Grand Canyon. Experience mountain lodges, pristine pine forests, canyon treks to tropical depths, waterfalls and Tarahumara Indians
1-800-843-1060 *FREE BROCHURE*
COLUMBUS TRAVEL, RT. 12, BOX 382-B, NEW BRAUNFELS, TX 78132

Help Someone You Love to Start A New Life..
NEW DIRECTIONS
Academy of Life Recovery
♦ Life-changing Residential Treatment ♦ Adult, Co-ed
♦ Combination Therapy & Education ♦ Enhancing Self-Esteem
♦ 12-Step Principles of Recovery for Addictive Behaviors
Overcoming: depressions, stress, phobias, addictions, dependencies, emotional pain, immature/indecisive behaviors, hopelessness
For free brochure call 1-800-433-3018

MONOPOLY®

THE COLLECTOR'S EDITION



All ten classic playing tokens are crafted in solid pewter and embellished with 24 karat gold.

Architecturally designed houses and hotels are die-cast and accented with sterling silver or gold.

The exclusive edition—fit for a millionaire! Authorized and fully authenticated by Parker Brothers.

It's a classic from the word "GO!" With new, spectacularly designed houses and hotels, tokens rich with the glow of 24 karat gold electroplate, a distinctive "Real Estate Portfolio," and much, much more—including *double* the usual supply of money!

Best of all, the lush green playing surface is luxuriously framed in fine hardwood, to present the classic MONOPOLY® game graphics as never before! It's a grand combination of tradition and beauty for your home. Just $495, payable in monthly installments. Exclusively from The Franklin Mint.

RETURN ASSURANCE POLICY

If you wish to return any Franklin Mint purchase, you may do so within 30 days of your receipt of that purchase for replacement, credit or refund.

Board shown much smaller than actual size of 20¾" L x 20¾" W x 3" H.

This solid brass MONOPOLY® game coin is set into the banker's drawer handle, to forever identify this Collector's Edition. (coin size is 21 mm).

Richly embellished with accents of sterling silver and 24 karat gold.

MONOPOLY® is a registered trademark of © 1992 Parker Brothers, Division of Tonka Corporation for its real estate trading game equipment

ORDER FORM

Please mail by July 31, 1992.

The Franklin Mint
Franklin Center, Pennsylvania 19091-0010

YES, I would like to enter my subscription for MONOPOLY®—*The Collector's Edition.*

I need SEND NO MONEY NOW. I understand that the complete game, including the hardwood-framed playing board, will be specially imported and sent to me in a single shipment. I will be billed for a deposit of $33.* prior to shipment, and for the balance in 14 equal monthly installments of $33.*, after shipment.

**Plus my state sales tax.*

SIGNATURE _____
ALL ORDERS ARE SUBJECT TO ACCEPTANCE

MR/MRS/MISS _____
PLEASE PRINT CLEARLY

ADDRESS _____ APT. NO. _____

CITY/STATE ZIP _____

12878-6JTR- 325

MONOPOLY® is a registered trademark of © 1992 Parker Brothers, Division of Tonka Corporation for its real estate trading game equipment

George Penta, 50, the only deaf member of his family, is coached in ASL and lipreading by his son Ryan, 13.

In ASL, a language of the eyes as well as the hands, facial expression is a key part of communication.

By Richard Wolkomir

American Sign Language: 'It's not mouth stuff—it's brain stuff'

Research on how deaf people communicate gives them a stronger hand in our culture, and casts new light on the origin of language

Photographs by Lynn Johnson

In a darkened laboratory at the Salk Institute in San Diego, a deaf woman is signing. Tiny lights attached to her sleeves and fingers trace the motions of her hands, while two special video cameras whir.

Computers will process her hands' videotaped arabesques and pirouettes into mathematically precise three-dimensional images. Neurologists and linguists will study these stunning patterns for insight into how the human brain produces language.

Sign has become a scientific hot button. Only in the

past 20 years have linguists realized that signed languages are unique—a speech of the hand. They offer a new way to probe how the brain generates and understands language, and throw new light on an old scientific controversy: whether language, complete with grammar, is innate in our species, or whether it is a learned behavior. The current interest in sign language has roots in the pioneering work of one renegade teacher at Gallaudet University in Washington, D.C., the world's only liberal arts university for deaf people.

When Bill Stokoe went to Gallaudet to teach English, the school enrolled him in a course in signing. But Stokoe noticed something odd: among themselves, students signed differently from his classroom teacher.

"Hand talk": a genuine language

Stokoe had been taught a sort of gestural code, each movement of the hands representing a word in English. At the time, American Sign Language (ASL) was thought to be no more than a form of pidgin English. But Stokoe believed the "hand talk" his students used looked richer. He wondered: Might deaf people actually have a genuine language? And could that language be unlike any other on Earth? It was 1955, when even deaf people dismissed their signing as "slang." Stokoe's idea was academic heresy.

It is 37 years later. Stokoe—now devoting his time to writing and editing books and journals and to producing video materials on ASL and the deaf culture—is having lunch at a café near the Gallaudet campus and explaining how he started a revolution. For decades educators fought his idea that signed languages are natural languages like English, French and Japanese. They assumed language must be based on speech, the modulation of sound. But sign language is based on the movement of hands, the modulation of space. "What I said," Stokoe explains, "is that language is not mouth stuff—it's brain stuff."

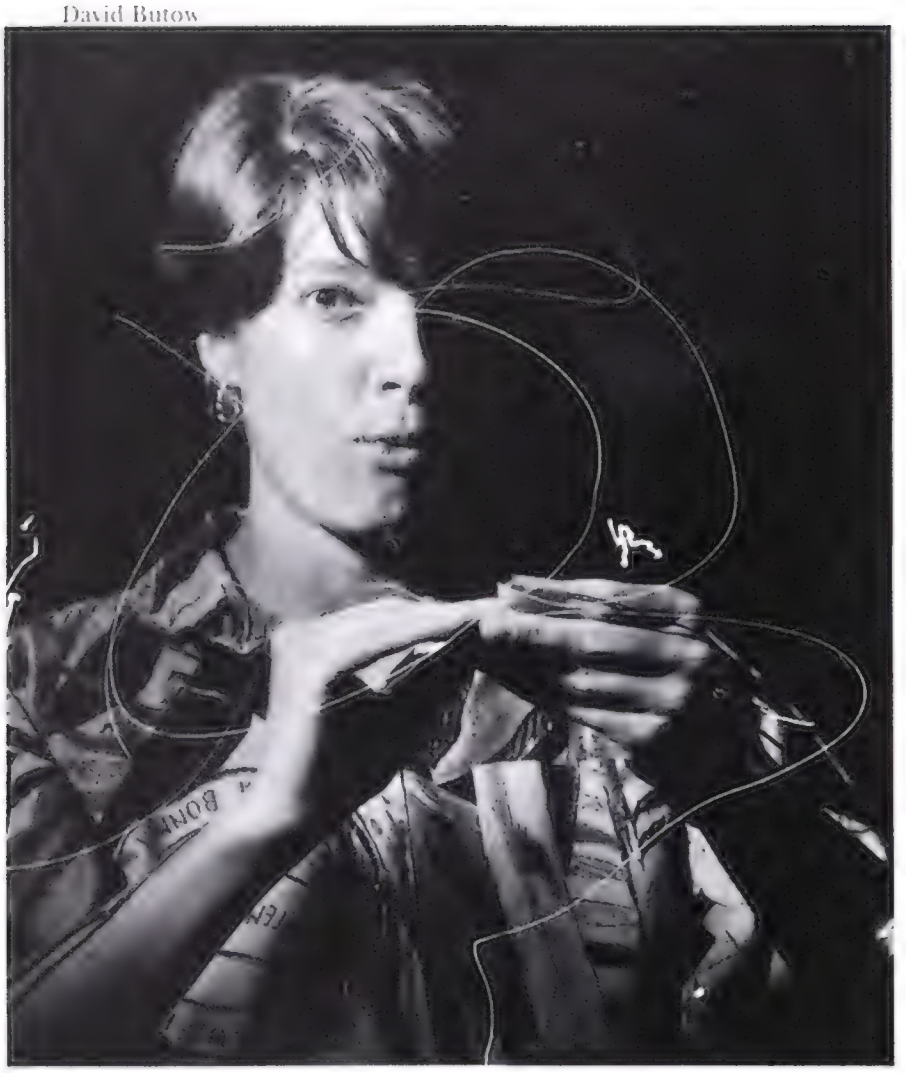
It has been a long road, from the mouth to the brain. Linguists have had to redefine language. Deaf people's self-esteem has been at stake, and so has the ticklish issue of their education.

"My own contribution was to turn around the thinking of academics," says Stokoe. "When I came to Gallaudet, the teachers were trained with two books, and the jokers who wrote them gave only a paragraph to sign language, calling it a vague system of gestures that looked like the ideas they were supposed to represent."

Deaf education in the '50s irked him. "I didn't like to see how the hearing teachers treated their deaf pupils—their expectations were low," he says. "I was amazed at how many of my students were brilliant." Meanwhile, he was reading the work of anthropological linguists like George Trager and Henry Lee Smith jr. "They said you

As George and Ryan review the alphabet together, the letter *R* mirrors the close rapport of father and son.

David Butow



Diodes on her arm and fingertip enable Salk researcher Kathy Say to trace the graceful pattern of ASL words.

Educator Bill Stokoe was one of first to recognize that ASL was not slang but a unique, complex language.

couldn't study language without studying the culture, and when I had been at Gallaudet a short time, I realized that deaf people had a culture of their own."

When Stokoe analyzed his students' signing, he found it was like spoken languages, which combine bits of sound—each meaningless by itself—into meaningful words. Signers, following similar rules, combine individually meaningless hand and body movements into words. They choose from a palette of hand shapes, such as a fist or a pointing index finger. They also choose where to make a sign; for example, on the face or on the chest. They choose how to orient the hand and arm. And each sign has a movement—it might begin at the cheek and finish at the chin. A shaped hand executing a particular motion creates a word. A common underlying structure of both spoken and signed language is thus at the level of the smallest units that are linked to form words.

Stokoe explained his findings on the structure of ASL in a book published in 1960. "The faculty then had a special meeting and I got up and said my piece," he says. "Nobody threw eggs or old vegetables, but I was bombarded by hostility." Later, the university's president told Stokoe his research was "causing too much trouble" because his insistence that ASL was indeed a *language* threatened the English-based system for teaching the deaf. But Stokoe persisted. Five years later he came out with the first dictionary of American Sign Language based on linguistic principles. And he's been slowly winning converts ever since.

"Wherever we've found deaf people, there's sign"

Just as no one can pinpoint the origins of spoken language in prehistory, the roots of sign language remain hidden from view. What linguists do know is that sign languages have sprung up independently in many different places. Signing probably began with simple gestures, but then evolved into a true language with structured grammar. "In every place we've ever found deaf people, there's sign," says anthropological linguist Bob Johnson. But it's not the same language. "I went to a Mayan village where, out of 400 people, 13 were deaf, and they had their own Mayan Sign—I'd guess it's been maintained for thousands of years." Today at least 50 native sign languages are "spoken" worldwide, all mutually incomprehensible, from British and Israeli Sign to Chinese Sign.

Not until the 1700s, in France, did people who could hear pay serious attention to deaf people and their language. Religion had something to do with it. "They believed that without speech you couldn't go to heaven," says Johnson.

For the Abbé de l'Epée, a French priest born into a wealthy family in 1712, the issue was his own soul: he

Ruth Benedict and her daughter Rachel play out a story using sign. The entire family is deaf and fluent in ASL. Rachel started to sign words when she was 11 months old.

feared he would lose it unless he overcame the stigma of his privileged youth by devoting himself to the poor. In his history of the deaf, *When The Mind Hears*, Northeastern University psychologist Harlan Lane notes that, in his 50s, de l'Epée met two deaf girls on one of his forays into the Paris slums and decided to dedicate himself to their education.

The priest's problem was abstraction: he could show the girls a piece of bread and the printed French word for "bread." But how could he show them "God" or "goodness"? He decided to learn their sign language as a teaching medium. However, he attempted to impose French grammar onto the signs.

"Methodical signing," as de l'Epée called his invention, was an ugly hybrid. But he did teach his pupils to read French, opening the door to education, and today he is a hero to deaf people. As his pupils and disciples proliferated, satellite schools sprouted throughout Europe. De l'Epée died happily destitute in 1789 surrounded by his students in his Paris school, which became the National Institution for Deaf-Mutes under the new republic.

Vermonter Richard Wolkomir has ranged widely for SMITHSONIAN. *He wrote about MIT's mobile robot project in June 1991 and the gadget gap in October.*

Other teachers kept de l'Epée's school alive. And one graduate, Laurent Clerc, brought the French method of teaching in sign to the United States. It was the early 1800s; in Hartford, Connecticut, the Rev. Thomas Hopkins Gallaudet was watching children at play. He noticed that one girl, Alice Cogswell, did not join in. She was deaf. Her father, a surgeon, persuaded Gallaudet to find a European teacher and create the first permanent school for the deaf in the United States. Gallaudet then traveled to England, where the "oral" method was supreme, the idea being to teach deaf children to speak. The method was almost cruel, since children born deaf—they heard no voices, including their own—could have no concept of speech. It rarely worked. Besides, the teachers said their method was "secret." And so Gallaudet visited the Institution for Deaf-Mutes in Paris and persuaded Laurent Clerc to come home with him.

During their 52-day voyage across the Atlantic, Gallaudet helped Clerc improve his English, and Clerc taught him French Sign Language. On April 15, 1817, in Hartford, they established a school that became the American School for the Deaf. Teaching in French Sign Language and a version of de l'Epée's methodical sign, Clerc trained many students who became teachers, too, and helped spread the language across the country.

Gallaudet homecoming queens join other students in a cheer at pep rally the night before football game.

Clerc's French Sign was to mingle with various "home" signs that had sprung up in other places. On Martha's Vineyard, Massachusetts, for example, a large portion of the population was genetically deaf, and virtually all the islanders used an indigenous sign language, the hearing switching back and forth between speech and sign with bilingual ease. Eventually, pure French Sign would blend with such local argots and evolve into today's American Sign Language.

After Clerc died, in 1869, much of the work done since the time of de l'Epée to teach the deaf in their own language crumbled under the weight of Victorian intolerance. Anti-Signers argued that ASL let the deaf "talk" only to the deaf; they must learn to speak and to lip-read. Pro-Signers pointed out that, through sign, the deaf learned to read and write English. The Pros also noted that lipreading is a skill that few master. (Studies estimate that 93 percent of deaf schoolchildren who were either born deaf or lost their hearing in early childhood can lip-read only one in ten everyday sentences in English.) And Pros argue correctly that the arduous hours required to teach a deaf child to mimic speech should be spent on real education.

"Oralists" like Horace Mann lobbied to stop schools from teaching in ASL, then *the* method of instruction in all schools for the deaf. None was more fervent than Alexander Graham Bell, inventor of the telephone and husband of a woman who denied her own deafness. The president of the National Association of the Deaf called Bell the "most to be feared enemy of the American deaf." In 1880, at an international meeting of educators of the deaf in Milan, where deaf teachers were absent, the use of sign language in schools was proscribed.

After that, as deaf people see it, came the Dark Ages. Retired Gallaudet sociolinguist Barbara Kannapell, who is cofounder of Deafpride, a Washington, D.C. advocacy group, is the deaf daughter of deaf parents from Kentucky. Starting at age 4, she attended an "oral" school, where signing was outlawed. "Whenever the

All-deaf choir offers signs of praise at Sunday Mass for deaf congregation of church in south Pittsburgh.

In a huddle at Gallaudet: the huddle originated here in 1890s so players could hide signs from other team.

teacher turned her back to work on the blackboard, we'd sign," signs Kannapell. "If the teacher caught us using sign language, she'd use a ruler on our hands."

Kannapell has tried to see oralism from the viewpoint of hearing parents of deaf children. "They'll do anything to make their child like themselves," she signs. "But, from a deaf adult's perspective, I want *them* to learn sign, to communicate with their child."

In the 1970s, a new federal law mandated "mainstreaming." "That law was good for parents, because they could keep children home instead of sending them off to special boarding schools, but many public schools didn't know what to do with deaf kids," signs Kannapell. "Many of these children think they're the only deaf kids in the world."

Gallaudet's admissions director, James Tucker, an exuberant 32-year-old, is a product of the '70s mainstreaming. "I'd sit in the back, doing work the teacher gave me and minding my own business," he signs. "Did I like it? Hell no! I was lonely—for years I thought I was an introvert." Deaf children have a right to learn ASL and to live in an ASL-speaking community, he asserts. "We learn sign for obvious reasons—our eyes aren't broken," he signs. Tucker adds: "Deaf culture is a group of people sharing similar values, outlook and frustrations, and the main thing, of course, is sharing the same language."

Today, most teachers of deaf pupils are "hearies" who speak as they sign. "Simultaneous Communication," as it is called, is really signed English and not ASL. "It looks grotesque to the eye," signs Tucker, adding that it makes signs too "marked," a linguistic term meaning equally stressed. Hand movements can be exaggerated or poorly executed. As Tucker puts it: "We have zealous educators trying to impose weird hand shapes." Moreover, since the languages have entirely different sentence structures, the effect can be bewildering. It's like having Japanese spoken to English-speaking students with an interpreter shouting occasional English words at them.

New scientific findings support the efforts of linguists such as Bob Johnson, who are calling for an education system for deaf students based on ASL, starting in infancy. Research by Helen Neville, at the Salk Institute, shows that children *must* learn a language—any language—during their first five years or so, before the brain's neural connections are locked in place, or risk permanent linguistic impairment. "What suffers is the ability to learn grammar," she says. As children mature, their brain organization becomes increasingly rigid. By puberty, it is largely complete. This spells trouble because most deaf youngsters learn language late; their parents are hearing and do not know ASL, and the children have little or no contact with deaf people when young.

Bob Johnson notes that more than 90 percent of all deaf children have hearing parents. Unlike deaf children of deaf parents, who get ASL instruction early, they learn a language late and lag educationally. "The average deaf 12th-grader reads at the 4th-grade level," says Johnson. He believes deaf children should start learning ASL in the crib, with schools teaching in ASL. English, he argues, should be a second language, for reading and writing: "All evidence says they'll learn English better." It's been an uphill battle. Of the several hundred school programs for the deaf in this country, only six are moving toward ASL-based instruction. And the vast majority of deaf students are still in mainstream schools where there are few teachers who are fluent in ASL.

Meanwhile, researchers are finding that ASL is a living language, still evolving. Sociolinguist James Woodward from Memphis, who has a black belt in karate, had planned to study Chinese dialects but switched to sign when he came to Gallaudet in 1969. "I spent every night for two years at the Rathskeller, a student hangout, learning by observing," he says. "I began to see great variation in the way people signed."

Woodward later concentrated on regional, social and ethnic dialects of ASL. Visiting deaf homes and social clubs in the South, he found that Southerners use older forms of ASL signs than Northerners do. Southern blacks use even more of the older signs. "From them, we can learn the history of the language," he says.

Over time, signs tend to change. For instance, "home" originally was the sign for "eat" (touching the mouth) combined with the sign for "sleep" (the palm pillowing the cheek). Now it has evolved into two taps on the cheek. Also, signs formerly made at the center of the face migrate toward its perimeter. One reason is that it is easier to see both signs and changes in facial expressions in this way, since deaf people focus on a signer's face—which provides crucial linguistic information—taking in the hands with peripheral vision.

Signers use certain facial expressions as grammatical markers. These linguistic expressions range from pursed lips to the expression that results from enunciating the sound "th." Linguist Scott Liddell, at Gallaudet, has noted that certain hand movements translate as "Bill drove to John's." If the signer tilts his head forward and raises his eyebrows while signing, he makes the sentence a question: "Did Bill drive to John's?" If he also makes the "th" expression as he signs, he modifies the verb with an adverb: "Did Bill drive to John's inattentively?"

Sociolinguists have investigated why this unique language was for so long virtually a secret. Partly, Woodward thinks, it was because deaf people wanted it that way. He says that when deaf people sign to the hearing, they switch to English-like signing. "It allows hearing people to be identified as outsiders and to be treated carefully before allowing any interaction that could have a negative effect on the deaf community," he says. By keeping ASL to themselves, deaf people—whom Woodward regards as an ethnic group—maintain "social identity and group solidarity."

A key language ingredient: grammar

The "secret" nature of ASL is changing rapidly as it is being examined under the scientific microscope. At the Salk Institute, a futuristic complex of concrete labs poised on a San Diego cliff above the Pacific, pioneer ASL investigator Ursula Bellugi directs the Laboratory for Cognitive Neuroscience, where researchers use ASL to probe the brain's capacity for language. It was here that Bellugi and associates found that ASL has a key language ingredient: a grammar to regulate its flow. For example, in a conversation a signer might make the sign for "Joe" at an arbitrary spot in space. Now that spot stands for "Joe." By pointing to it, the signer creates the pronoun "he" or "him," meaning

Joyce Maravich works with a preschooler, Christopher Yater, at Western Pennsylvania School for the Deaf, which teaches all kinds of communication: ASL, speech and lipreading.

At Indiana School for the Deaf, Stephanie Davis (left), Cherish Lewis, Jenny Kanable, take a page from the Superkids. School runs a bilingual course: ASL first, then English.

David Butow

The Salk Institute's Ursula Bellugi directs research program on ASL and has been probing the brain's capacity for language.

"Joe." A sign moving toward the spot means something done *to* "him." A sign moving away from the spot means an action *by* Joe, something "he" did.

In the 1970s, Bellugi's team concentrated on several key questions that have been of central concern ever since MIT professor Noam Chomsky's groundbreaking work of the 1950s. Is language capability innate, as Chomsky and his followers believe? Or is it acquired from our environment? The question gets to the basics of humanity since our language capacity is part of our unique endowment as a species. And language lets us accumulate lore and pass it on to succeeding generations. Bellugi's team reasoned that if ASL is a true language, unconnected to speech, then our penchant for language must be built in at birth, whether we express it with our tongue or hands. As Bellugi (above) puts it: "I had to keep asking myself, 'What does it mean to be a language?' "

A key issue was "iconicity." Linguistics has long held that one of the properties of all natural languages is that their words are arbitrary. In English, to illustrate, there is no relation between the sound of the word "cat" and a cat itself, and onomatopoeic words like "slurp" are few and far between. Similarly, if ASL follows the same principles, its words should not be pictures or mime. But ASL does have many words with transparent meanings. In ASL, "tree" is an arm upright from the elbow, representing a trunk, with the fingers spread to show the crown. In Danish Sign, the signer's two hands outline a tree in the air. Sign languages are rife with pantomimes. But Bellugi wondered: Do deaf people *perceive* such signs as iconic as they communicate in ASL?

One day a deaf mother visited the lab with her deaf daughter, not yet 2. At that age, hearing children fumble pronouns, which is why parents say, "Mommy is getting Tammy juice." The deaf child, equally confused by pronouns, signed "you" when she meant "I." But the sign for such pronouns is purely iconic: the signer points an index finger at his or her own torso to signify "I" or at the listener to signify "you." The mother corrected the child by turning her hand so that she pointed at herself. Nothing could be clearer. Yet, as the child chattered on, she continued to point to her mother when she meant "I."

Bellugi's work revealed that deaf toddlers have no trouble pointing. But a pointing finger in ASL is linguistic, not gestural. Deaf toddlers in the "don't-understand-pronouns" stage do not see a pointing finger. They see a confusing, abstract word. ASL's roots may be mimetic, but—embedded in the flow of language—the signs lose their iconicity.

By the 1980s, most linguists had accepted sign languages as natural languages on an equal footing with English, Italian, Hindi and others of the world. Signed languages like ASL were as powerful, subtle and intricately structured as spoken ones.

The parallels become especially striking in wordplay and poetry. Signers creatively combine hand shapes and movements to create puns and other humorous

"Nothing we can do can kill the thing off."

– Bobby Winston, Producer, San Francisco Shakespeare Festival

"In a heavy fund-raising period, we've run our LaserJet 24 hours a day for days at a time. It just will not die," says producer Bobby Winston. "It's truly a phenomenal piece of engineering."

For years, experts have applauded LaserJet performance. In 1991 alone, HP LaserJet printers won *Printer of the Year* from Byte and InfoWorld; *Product of the Year* from Datamation and Byte; *Most Valuable Product* from PC Computing; *World Class* and *Best Buy* from PC World; and *Readers' Choice* from Publish.

All five models have received many accolades, from the 4 ppm personal LaserJet IIP to the 17 ppm LaserJet IIISi. With HP, you can get genuine PCL5 printer language, with scalable typefaces. And HP's exclusive Resolution Enhancement technology, for improved print quality. Prices range from $1,249 to $5,495.*

To hear what other customers have to say about HP LaserJet printers, call **1-800-752-0900, Ext. 2988** for a free video. You'll see why the LaserJet is a hard act to follow.

HP LaserJet Printers.

HEWLETT PACKARD

*Suggested U.S. list prices.

©1992 Hewlett-Packard Company PE12251

Two deaf youngsters at western Pennsylvania school interact with a deaf senior citizen in a special program.

alterations of words. A typical pun in sign goes like this: a fist near the forehead and a flip of the index finger upward means that one understands. But if the little finger is flipped, it's a joke meaning one understands a little. Clayton Valli at Gallaudet has made an extensive study of poetry in ASL. He finds that maintenance or repetition of hand shape provides rhyming, while meter occurs in the timing and type of movement. Research with the American Theater of the Deaf reveals a variety of individual techniques and styles. Some performers create designs in space with a freer movement of the arms than in ordinary signing. With others, rhythm and tempo are more important than spatial considerations. Hands may be alternated so that there is a balance and symmetry in the structure. Or signs may be made to flow into one another, creating a lyricism in the passage. The possibilities for this new art form in sign seem bounded only by the imagination within the community itself.

The special nature of sign language provides unprecedented opportunities to observe how the brain is organized to generate and understand language. Spoken languages are produced by largely unobservable movements of the vocal apparatus and received through the brain's auditory system. Signed languages, by contrast, are delivered through highly visible movements of the arms, hands and face, and are received through the brain's visual system. Engagement of these different brain systems in language use makes it possible to test different ideas about the biological basis of language.

The prevailing view of neurologists is that the brain's left hemisphere is the seat of language, while the right controls our perception of visual space. But since signed languages are expressed spatially, it was unclear where they might be centered.

To find out, Bellugi and her colleagues studied lifelong deaf signers who had suffered brain damage as adults. When the damage had occurred in their left hemisphere, the signers could shrug, point, shake their heads and make other gestures, but they lost the ability to sign. As happens with hearing people who suffer left-hemisphere damage, some of them lost words while others lost the ability to organize grammatical sentences, depending on precisely where the damage had occurred.

Conversely, signers with right-hemisphere damage signed as well as ever, but spatial arrangements confused them. One of Bellugi's right-hemisphere subjects could no longer perceive things to her left. Asked to describe a room, she reported all the furnishings as being on the right, leaving the room's left side a void. Yet she signed perfectly, including signs formed on the left side. She had lost her sense of *topographic* space, a right-hemisphere function, but her control of *linguistic* space, centered in the left hemisphere, was intact. All of these findings support the conclusion that language, whether visual or spoken, is under the control of the left hemisphere.

One of the Salk group's current efforts is to see if learning language in a particular modality changes the brain's ability to perform other kinds of tasks. Researchers showed children a moving light tracing a pattern in space, and then asked them to draw what they saw. "Deaf kids were way ahead of hearing kids," says Bellugi. Other tests, she adds, back up the finding that learning sign language improves the mind's ability to grasp patterns in space.

Thinking and dreaming in signs

Salk linguist Karen Emmorey says the lab also has found that deaf people are better at generating and manipulating mental images. "We found a striking difference in ability to generate mental images and to tell if one object is the same as another but rotated in space, or is a mirror image of the first," she says, noting that signers seem to be better at discriminating between faces, too. As she puts it: "The question is, does the language you know affect your other cognitive abilities?"

Freda Norman, formerly an actress with the National Theater of the Deaf and now a Salk research associate, puts it like this: "English is very linear, but ASL lets you see everything at the same time."

"The deaf *think* in signs," says Bellugi. "They *dream* in signs. And little children sign to themselves."

At McGill University in Montreal, psychologist

Laura Ann Petitto recently found that deaf babies of deaf parents babble in sign. Hearing infants create nonsense sounds like "babababa," first attempts at language. So do deaf babies, but with their hands. Petitto watched deaf infants moving their hands and fingers in systematic ways that hearing children not exposed to sign never do. The movements, she says, were their way of exploring the linguistic units that will be the building blocks of language—their language.

Deaf children today face a brighter future than the generation of deaf children before them. Instruction in ASL, particularly in residential schools, should accelerate. New technologies, such as the TDD (Telecommunications Device for the Deaf) for communicating over telephones, relay services and video programs for language instruction, and the recent Americans with Disabilities Act all point the way to a more supportive environment. Deaf people are moving into professional jobs, such as law and accounting, and more recently into computer-related work. But it is not surprising that outside of their work, they prefer one another's company. Life can be especially rewarding for those within the ASL community. Here they form their own literary clubs, bowling leagues and gourmet groups.

As the Salk laboratory's Freda Norman signs: "I love to read books, but ASL is my first language." She adds, smiling: "Sometimes I forget that the hearing are different."

Gallaudet football manager David Culhane and a friend sit in the game drum, which is used to start a play from scrimmage. Signal-by-drum works well for deaf players, who are able to pick up the vibrations.

The new
Right from the start,

A costly option on most imports, anti-lock brakes are standard on Skylark.

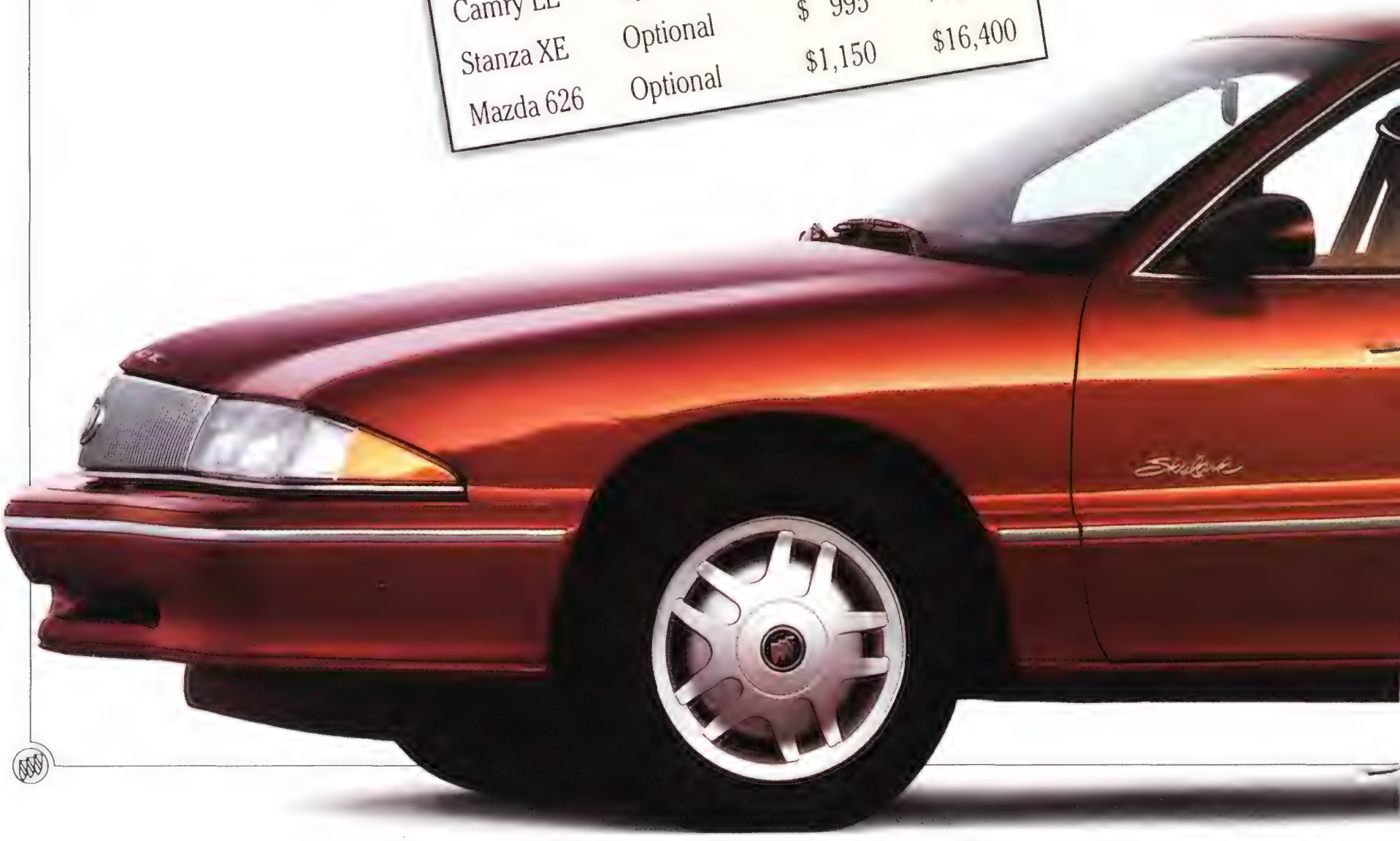
You can't put a price on safety. Which is why anti-lock brakes, one of today's most important automotive safety features, are standard equipment on every 1992 Skylark.

On most imports in Skylark's class, you'd have to pay around $1,000 extra for an anti-lock brake system. And the new Skylark comes with GM's advanced ABS VI, the safety feature *Automobile Magazine* named 1992's Technology of the Year.

	Anti-Lock Brakes	Cost	M.S.R.P.†
Skylark	Standard	No cost	$14,035
Accord LX	Not available	—	$16,865
Camry LE	Optional	$1,130	$18,400
Stanza XE	Optional	$ 995	$14,995
Mazda 626	Optional	$1,150	$16,400

Quality That Lasts

All of Skylark's exterior panels are made from 2-side-galvanized steel for maximum corrosion resistance, and are protected by a 6-year/100,000-mile



Buick Skylark. it stops the imports.

rust-through warranty.*

Fuel-Efficient Fun

The 1992 Skylark is powered by a new Quad OHC 2.3-litre engine, or by an available 3300 V6. Either way, it's still economical to operate. With an EPA-estimated 23 miles per gallon city and 31 miles per gallon highway, the Quad OHC-equipped Skylark gets better gas mileage than Honda Accord or Toyota Camry.

Visit your Buick dealer for a test drive. You'll see how, right from the start, the all-new Skylark stops the imports. Or for more information, please call 1-800-435-5552.

*See your dealer for terms of this limited warranty
†Manufacturer's suggested retail price including destination charges, dealer prep and anti-lock brakes where available. Tax, license and other options additional. Levels of equipment vary

Skylark is a registered trademark of GM Corp
©1992 GM Corp. All rights reserved.
Buckle up, America!

BUICK

The New Symbol For Quality In America.

By Bruce Fellman

Rose rustlers are giving 'antique' varieties new life

Hybrid teas dominate gardens today, but the older roses are beautiful, too, and require far less watering, spraying, pruning

A little past high noon on the busy corner of East Piedmont Street and North Brosig Avenue in Navasota, Texas, two of the Lone Star State's most unusual miscreants are hard at work. A gnarled hackberry tree provides scant cover, but the outlaws don't seem to mind exposure as they calmly make the cuts.

They have almost finished when a gentleman on his afternoon constitutional happens by, stops and nervously asks the duo, "What are you folks doing?"

There's an uneasy silence, and people who've been watching the robbery crane their necks to see the next act. G. Michael Shoup, a big, bearded man with an easy laugh, turns to his partner, Pamela Puryear, a.k.a. "Calamity Jane," and they share a smile before turning back to the walker. The tools of their trade trained on the man, Shoup replies, "We're rose rustling, mister."

"Rose rustling? I never heard of that," the walker says, pausing to scratch his head. "Say, is that a hangin' offense?"

Texas folklore is replete with tales of manila-and-hemp justice meted out to horse and cattle thieves, but so far, the horticultural "rustlers" who take rose cuttings and leave the shrubs to flourish have not met with the noose. In fact, they've met mostly with praise, and for good reason. Shoup and Puryear (opposite), along with like-minded gardeners in their home state and throughout the nation, are part of a movement to save myriad varieties of "antique" roses. These plants were once popular in the cottage gardens and estates of the 19th century and earlier, but until the rustlers came along, the flowering antiques were as much in danger of extinction as is the imperiled Furbish lousewort.

The old roses had fallen victim to fashion.

According to Tom Christopher, author of *In Search of Lost Roses*, we've cultivated members of the plant genus *Rosa* for at least 5,000 years. The earliest known records are from Mesopotamia in 3000 B.C., and though scholars presume that early growers did little more than domesticate wild plants with desirable qualities, no doubt ambitious hybridizers soon went to work. By the middle of the last century, rosarians had created thousands of varieties that were organized into more than a dozen classes, among them the China, Bourbon, damask, tea, gallica, moss, Noisette and alba roses.

In 1867, growers introduced a new class. Hybrid teas, of which the first member was La France, had exquisite, florist-quality blossoms, bloomed throughout the gardening season and could better tolerate cold climates.

Gardeners and the garden industry took up the new roses with a passion, and the antiques—defined by the American Rose Society as any class with pre-La France origins—all but vanished from nurseries and catalogs. Unless you had access to a garden with a sense of the past, it became difficult to even see the old roses. Souvenir de la Malmaison, named in honor of the Empress Josephine's famous rose garden; the "Sweetbrier Rose," the eglantine of *A Midsummer Night's Dream*; and York and Lancaster, a bicolored damask rose commemorating the combatants in England's 15th-century Wars of the Roses—these plants and more could be found mainly in the artwork of Redouté, the plays of Shakespeare and musty old horticultural books.

Along back roads a movement was born

But while the old varieties were largely forgotten, they didn't vanish, not entirely. These plants lived on in relative obscurity around the country. Cottage gardeners, particularly in California and the Southeast, tended the undemanding shrubs and passed around cuttings to keep tradition intact. But the roses, true survivors, also thrived with no care whatsoever; and along our nation's back roads and byways, as well as in cemeteries, a movement was born. Armed with clippers and buckets of willow water—a surefire rooting compound, as well as a remedy for headaches, sore muscles and thorn gouges—rustlers from Virginia to Oregon are rescuing the antiques from oblivion.

"Our mission is preservation," explains Jackie Fischer,

Pamela Puryear found this old variety, study-named "Pam's Pink" for now, on a deserted lot in Navasota.

Photographs by Will van Overbeek

Near Independence, Texas, Addie Breedlove tends Old Blush rosebush that once belonged to her mother.

White rugosa, Sir Thomas Lipton, thrives under the care of G. Michael Shoup. Rose dates "only" from 1900.

who heads the Texas Rose Rustlers, a loosely organized, Houston-based group dedicated to finding and propagating these old beauties. On a warm autumn night, Fischer shows off her roses, many of which came from cuttings collected during rustles. The air in the garden is rich with their perfume.

"The fragrance, of course, is one of the real benefits of these plants—most modern roses don't smell like anything," she notes, stopping by a Monsieur Tillier, a late 19th-century rose that carries the distinct scent of tea. Other varieties smell of cinnamon, bananas, cloves, pineapples, mangoes, even myrrh. The aroma is a passport back to another time.

Fragrance, however, is not the only reason to preserve the antiques. "They've got gorgeous blooms," says Fischer, "and the plants are survivors. When I grew modern varieties, I had to water, prune and use my sprayer faithfully. Well, I got tired of all the care. I don't have time to be a slave to my flowers. The old varieties don't demand a lot from my life."

Margaret Sharpe, one of the founders of the Texas rose rustling movement, puts it another way: "Old roses can stand up for themselves!"

Sharpe started raising roses in the late 1940s, when modern, hybrid tea varieties were what people grew. She explains that while their flowers are undeniably beautiful, the plants themselves can be wimps. Even with coddling, hybrid teas are lucky to survive three or four years in the torrid Texas summers. Like many Lone Star gardeners, Sharpe was frustrated by having to constantly replace plants. Then, in the late 1970s, she met Pam Puryear.

"I could say '*Phlox subulata*' before I could say 'shoe,'" notes Puryear, a human dynamo and dedicated gardener. Along with her mother and, at last count, 27 cats, she presides over her family's rambling ancestral home in Navasota. "I figure that if you have antique houses, furniture, clothing and the like, why not have your antique yards?"

About 20 years ago, Puryear, an inveterate amateur historian, was exploring a long-abandoned 19th-century log house that overlooked the Brazos River valley. It was August, a time, she says, when "God is sparing with His watering can," and yet on both sides of the cabin were roses flowering so exuberantly that "you couldn't put your finger between the blooms." Her modern hybrid teas had withered in the heat and drought, but these shrubs were thriving. "I figured then and there that it wasn't me who had the black thumb—I was just planting the wrong roses."

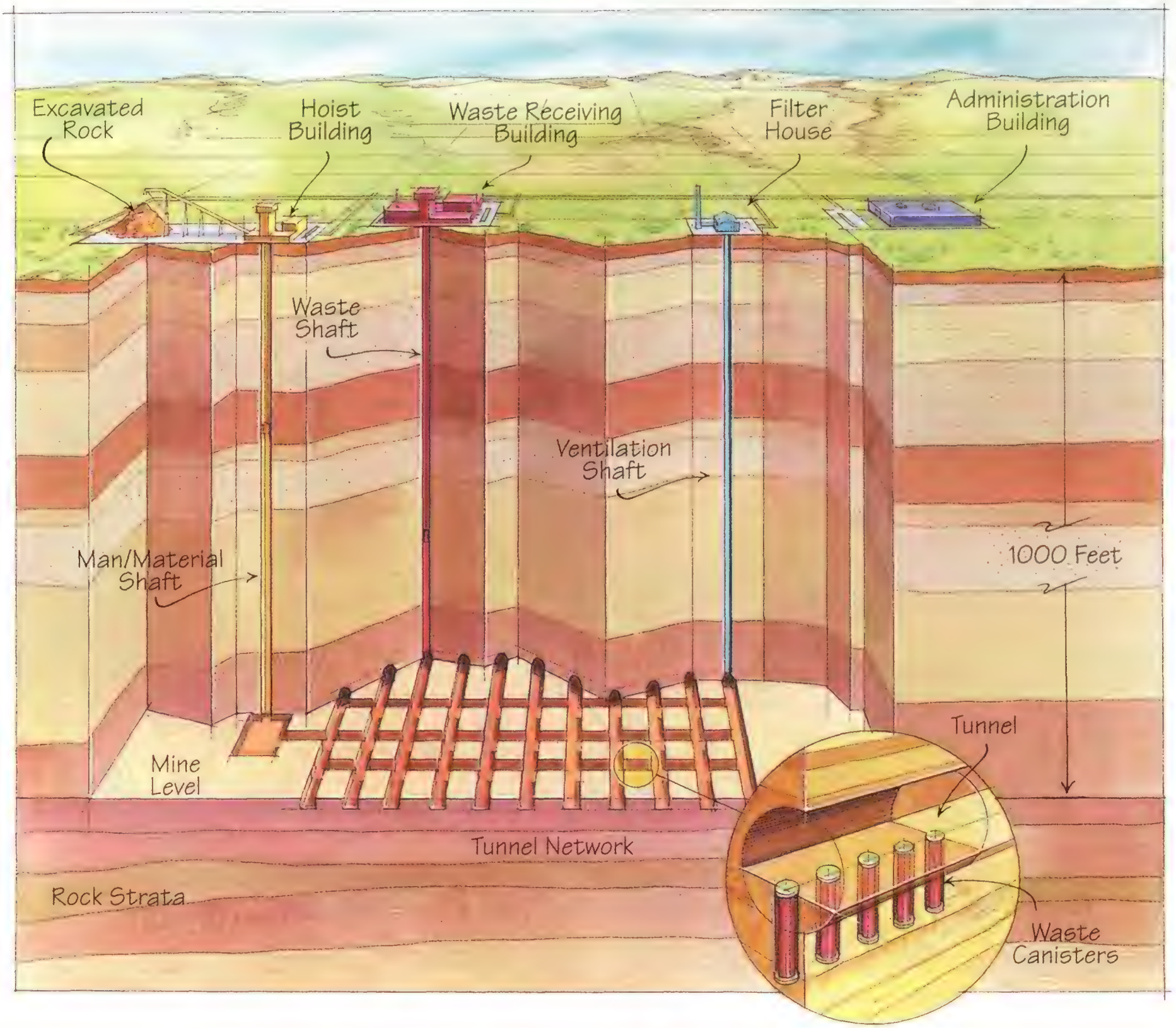
Her find, which had been growing unattended for at least a generation, turned out to be Old Blush, a rose from China that was introduced in the West in 1752. Once Puryear identified it, she started finding this venerable shrub in all sorts of out-of-the-way places.

Nor was it the only variety growing without benefit of human care. Whenever she found a new variety, she took cuttings, rooted them, and in time-honored fashion, passed them on to gardening friends. Roses have always moved around on a kind of underground railroad, Puryear says. When people moved them from place to place, "they'd often stick rose cuttings in a potato to keep them moist, and the plants would be fine for a couple of days."

Puryear met Sharpe in Houston, and by the early '80s the two rosarians and a handful of acolytes were going on regular jaunts. "Pam got us interested in seeing what we could find in these old homesteads," notes Sharpe.

Puryear dubbed the group the Brazos Symposium of

While riding with the Texas rustlers, author Bruce Fellman was able to have an as-yet-unidentified rose provisionally named the "Pamela Shaw" for his wife.



To Most People, It's A Complex Diagram. To Scientists, It's A Clear Summary Of Safe Nuclear Waste Disposal.

More than 30 years of scientific study have confirmed and reconfirmed how to safely, permanently dispose of the used fuel from nuclear electric plants: isolate it geologically.

According to the National Academy of Sciences, "There is a strong worldwide consensus that the best, safest long-term option for dealing with high-level waste is geologic isolation." The used nuclear fuel (in the form of ceramic pellets) would be sealed inside layers of steel; put in carefully engineered structures at least 1,000 feet underground, within dry rock formations that have a long history of geologic stability; and monitored closely.

Also agreeing on the safety and feasibility of this solution are the Environmental Protection Agency and the American Physical Society. For more information on the conclusions of these and other independent authorities, please write to the U.S. Council for Energy Awareness, P.O. Box 66080, Department WA06, Washington, D.C. 20035.

© 1992 USCEA

Fortune's Double Yellow, brought out of China by Robert Fortune in 1845, flourishes at the Emporium.

Red rose is Ards Rover, of a mid-1800s class. The pink one beneath is Souvenir de Mme. Léonie Viennot.

Flowers of the "Butterfly Rose" start out yellow, turn pink and then red; often, all three colors are present.

Old Garden Roses to lend an air of academic respectability to their activities, but the moniker soon changed as a result of a collecting trip near Bellville, Texas. "We were visiting the property of a man in the country, and you know that out there, the neighbors are very protective of each other," Sharpe recollects. "So there we were prowling around, and out comes a neighbor with a shotgun—it was just electrifying! He says, 'What are you people doing out here?' We answer, 'Well, sir, we're looking for old roses.' That didn't set well with him, and he said, 'You better get out of here, young'uns.' We *got*. And the next year, when it was time to go collecting, someone remarked, 'Let's go rustle us some roses.' The name stuck."

Nor were Sharpe, Puryear and company the only rustlers. They were soon joined by William C. Welch, extension landscape horticulturist at Texas A&M University. For years he had been finding the amazingly tough antique varieties in cemeteries—where they adorned grandma's and great-grandma's graves—and in the yards of old homes throughout the state. "I've always had an interest in antique roses," he explains. "Old Blush has been in my family for a long time."

The idea of time-tested plants

As a plantsman with an abiding professional interest in landscape design, Welch found the old roses ideal for Southern gardens (there are also many varieties perfect for the North) and recognized their commercial potential. "I like the idea of time-tested plants. These have been around here for 100 to 150 years, and very often in the same community, so we know they work. That history adds to what architects call the sense of place."

In the late '70s, Mike Shoup had settled his wholesale plant-growing business in Independence, about 20 miles from Navasota. "I got into roses through the back door," he explains. "Everyone starts with the flower, but I was fascinated by the plants. There are a diversity of forms, everything from weeping varieties to climbers, and I saw old garden roses as an antidote to 'mustache' landscaping—that's the boring, one-dimensional planting of boxwood or privet that looks like you've drawn a mustache on your foundation."

The antiques brought dramatic possibilities to the landscape, along with fragrance, floral beauty and nostalgia. "I think old roses are the best thing yet for modern gardens," Shoup declares.

The nurseryman met up with Puryear and the rest of the rustling gang in the early '80s, and many of their finds wound up on his acreage. As the stock grew, Shoup and Welch launched a business called the Antique Rose Emporium, which, through its display gardens and mail-order catalog, now offers more than

BERMUDA SHORTS

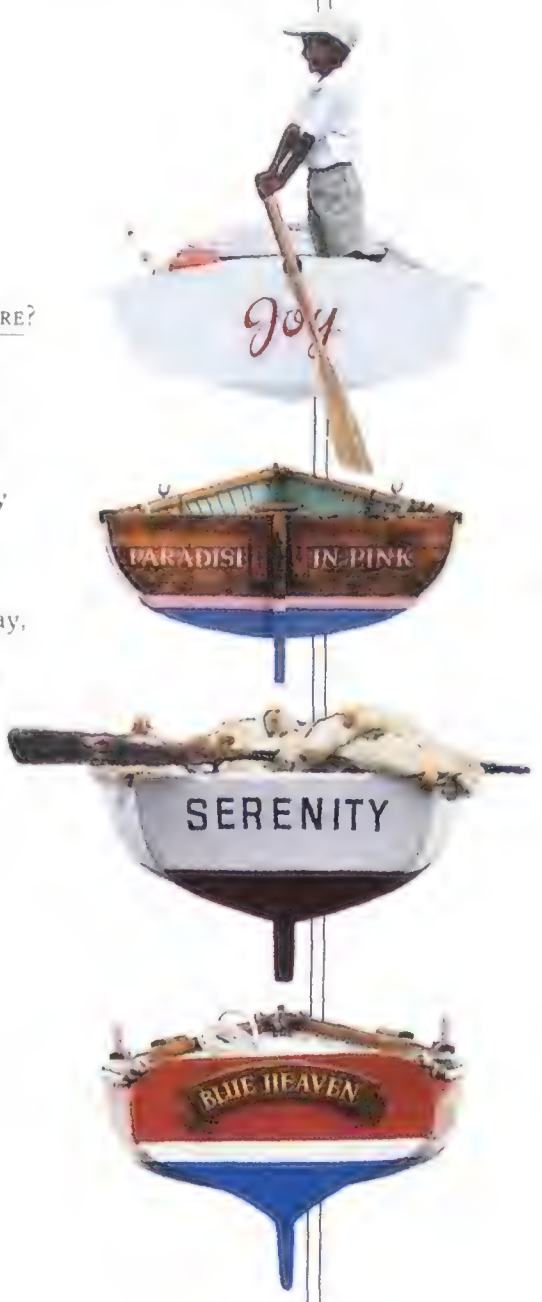
ON FEELING PACIFIC BY THE ATLANTIC.

FEEL THE OCEAN BREEZE FROM ANY WINDOW.

Wherever you stay in Bermuda, the ocean is never more than a mile away.

NEED WE SAY MORE?

Our quiet little towns, winding lanes and sleepy shores make a Bermudian holiday, well, read it for yourself.



SIT ON A BLANKET OF PINK SAND.

Our famous pink beaches just happen to be next to our brilliant azure seas. Call it luck.

Call your travel agent or: 1-800-BERMUDA.

BERMUDA. A SHORT TRIP TO THE PERFECT HOLIDAY.

Rose rustlers are rescuing the antiques

This was "Climbing Lady Pamela" (Puryear)—until it was identified as Souvenir de Mme. Léonie Viennot.

250 different varieties of rose. Shoup emphasizes that not all of them are pre-La France. "Classes like the hybrid musks and the polyanthas, which were introduced in the late 19th and early 20th centuries, may not fit the technical definition of an old garden rose, but they're still excellent, user-friendly plants," he explains. "If a rose has a classic old-style blossom, smells great and is easy to care for—hallmarks of the pre-La France roses—why stand on ceremony?"

New antiques continue to arrive every year as an expanding band of rustlers from around the United States send Shoup cuttings to propagate, preserve and maybe restore to commerce. (Welch bowed out of the business about six years ago.) As we toured the Quonset-style greenhouses where Shoup currently raises more than 400,000 cuttings a year, he talked about one of the finds that had arrived in the mail. "The rose came from a woman in Slidell, Louisiana, and she got it from a woman named Ceelie," he said, explaining the origin of this hand-me-down. The letter explained: "Ceelie is the elderly black lady I bought the cutting from over 30 years ago. . . . She could have planted a Popsicle stick and had it grow." The Emporium is raising the plant, which it has named "Ceelie's Slidell Pink Climbing Rose."

Nomenclature is a thorny issue among rosarians. For starters, the same rose can have a number of different names, each of which was correct at one point in the plant's history. Typical is Fortune's Double Yellow, a rose discovered and spirited out of China in 1845 by Robert Fortune, a Scotsman sent there by Great Britain's Royal Horticultural Society on a plant-collecting mission. In addition to taking his name, the rose is also known in the trade as the "Beauty of Glazenwood" and "Gold of Ophir."

Names from "Huilito" to "Natchitoches Noisette"

Because of such taxonomic confusion, today every foundling of indeterminate origin gets a study name. This handle may reflect the discoverer or some interesting fact about the discovery. And so, in Shoup's catalog, there are such found roses as "Huilito," which was named by Tommy Adams, one of Shoup's employees, in honor of his grandfather. There's also "Martha Gonzales," "Natchitoches Noisette" and "Old Gay Hill Red China," among others.

As long as the rose remains unidentified, the study name sticks. But as interest in these plants has grown, scholars have taken up the nomenclatural challenge. The lengthy, difficult process starts, says Shoup, with experienced rosarians like Margaret Sharpe and Charles A. Walker jr., president of the Heritage Rose Foundation, looking at the foundling and trying to match it with already known varieties. If that doesn't work, the

THE 5TH UNWRITTEN LAW OF DRIVING

IF THERE IS A HOLE IN THE ROAD YOU WILL HIT IT.

The new Isuzu Trooper has been thoughtfully redesigned around a rather jarringly obvious point: city infrastructures are falling apart. Which tends to make driving on the road feel a lot like driving off the road, which is why the new Trooper is equipped with an incredibly smooth, quiet suspension system that doesn't know the difference.

ISUZU
Practically/*Amazing*

Three sisters hold Cramoisi Supérieur blooms from a bush their mother bought for ten cents 75 years ago. Mary Mazan, 86; Theresa Meyer, 78; and Cecilia Bronikowski, 90, are pictured in Meyer's Brenham yard.

researchers turn to old catalogs, horticulture books, even centuries-old artwork, to track down the mystery plant. Shoup has also employed another tack: he orders likely candidates from European catalogs, grows the roses and compares the blossoms.

As a result of such detective work, a number of rustling monikers have fallen by the wayside. "Climbing Lady Pamela"—one of Puryear's finds—was unmasked as Souvenir de Mme. Léonie Viennot. "Mary Minor," named for an elderly gardener in Anderson, Texas, turned out to be the famous Souvenir de la Malmaison. The "Hole Rose," so designated because it grew in a particular hole by the road, proved to be a Marie van Houtte.

A rose tended for more than 75 years in Brenham, Texas, was none other than Cramoisi Supérieur, a lovely crimson China variety introduced in 1832 and praised by 19th-century nurseryman Thomas Rivers for its "peculiar richness of colour." Theresa Meyer's well-tended yard has attracted rustlers for years, and the still-spry 78-year-old gardener has cultivated a wealth of antique plants. She explains that her mother purchased the heirloom rose from a catalog for a dime. "My parents rented farms, and every time they moved, they dug plants up and took them along," she notes. "My mother said, 'When I die, you better take care of the flowers,' and I have."

Theresa Meyer has also passed along the family treasure, rooting cuttings and giving them to her two older sisters, who garden in Brenham as well. The fragrance of the old rose takes the three of them (above) back to the farm, they agree, and they're happy to share their bit of history with the rustlers, although Theresa worries that she may not have enough cuttings to go around when they come calling.

It's a reasonable fear. What started out as a one-car ramble is now an organized campaign involving about 75 people and dozens of vehicles. The Big Rustle, which takes place every October, has become a social gathering and an occasion to exchange cuttings; however, participants still comb the countryside, hoping for the best.

© 1992 AT&T. All rights reserved.

AT A TIME LIKE THIS, WHOSE CELLULAR PHONE WOULD YOU RATHER OWN?

When the name on the phone is AT&T, you're getting something no other cellular phone can give you. AT&T quality and customer service. We back our cellular phones with a 7-day, toll-free Cellular Hotline—for product information, technical help, even next-business-day replacement anywhere in the Continental U.S. Call 1 800 232-5179 for all the details.

DEPENDABILITY BEYOND THE ORDINARY

AT&T

Available at AT&T Phone Centers and other fine retailers.

This Zéphirine Drouhin, a thornless Bourbon, shows signs of black spot but prospers despite the disease.

Puryear gives the high-pitched cry that indicates she's spotted something interesting. We're in Navasota, and Shoup, driving, slows and readies his clippers.

"Now that right there is the perfect type of rustling house. There are little plants everywhere, and there's a rose right by the bathtub sitting in the front yard. And next to that house over there, well, is that a [*Rosa*] *banksia?*" Puryear wonders, pointing to a plant by a rickety trellis. "That sure is a nice tea . . . we'll have to come rustle here . . ."

In nearby Anderson, Puryear's practiced eyes spot several intriguing specimens near the historic home of Dr. Benjamin Briggs Goodrich, a hero of the Texas independence movement. While she takes cuttings, we pull burs out of our ankles. No pain, no gain.

"We've rustled his house," she says with glee. "Now let's go rustle his grave."

Goodrich has gone to his rest in the Odd Fellows Cemetery in town (opposite), but about the only collectible rose on the hilltop graveyard is Old Blush. Overzealous workers often do too good a job, Puryear and Shoup sadly concur, and many cemetery roses have fallen victim to the rustlers' archenemy: perpetual care arrangements that include frequent mowing.

We are skunked at another graveyard Shoup had discovered off a dirt road near Independence. The live oaks, festooned with polypody ferns and Spanish moss, cast too much shade for any rose except *Rosa plastica.* But where the oak woods give way to bluestem pasture and moon-faced dairy cows, there are roses—but none anyone wants. *Rosa bracteata*, the Macartney Rose, was originally planted as a "living fence." Unfortunately, it became a plague on ranchers' fields. As we observe its vicious thorns, Shoup points out another feature of the countryside: "You're standing on top of a fire ant nest."

I jump—too late—and soon feel hot needles in my flesh. "It's part of the experience," Shoup says with a good-natured laugh. "As you're mulling over the day's cuttings, you're also tenderizing your fire ant wounds."

Neither fire ants nor the poisonous snakes that are hazards on many rose expeditions were a concern as we called on Addie Breedlove, a nonagenarian whose modest yard was swept clean of all hostile organisms and almost all vegetation. In the sandy soil, ringed here and there with white rocks, were ancient Crinum lilies and bearded irises, along with some heirloom roses: Old Blush, a Bourbon rose named "Maggie" and Cramoisi Supérieur among them. Mrs. Breedlove got her starts from her mother and has kept them going for decades.

"We've found many interesting plants in poor neighborhoods and gardens," notes Shoup, explaining that poverty has been the inadvertent salvation of a number of antiques. Ill-paid workers, even slaves, learned to root cuttings of the favorite plants they tended on ranches and estates. "They couldn't afford to keep up with changing plant fashions so they kept the old roses and cherished them," he says. "After you keep seeing these same varieties over and over, you get a glimpse of what it was like a hundred years ago."

"I got into roses because they were beautiful"

Later in the day we finally strike gold in Caldwell, where retired Texas A&M mathematician Robert Basye watches over some of the nearly 5,000 plants he's meticulously hybridized during the past 50 years. Basye, a powerhouse even in his early 80s, began his work during the Depression to preserve his mental health. "I got into roses because they were beautiful," he notes, as we sip tea and listen to classical music in his Spartan house. "I'm not interested in making any

money from them. I'm not interested in recognition. Isn't something to lift your spirits reason enough?"

What he's after is perfection: a rose immune to black spot, a notorious disease, as well as one that's thornless and bears gorgeous, fragrant blossoms throughout the growing season. Like all hybridizers, he has based his plan of attack on finding plants with desirable qualities, both those in commerce and in the wild, and then crossbreeding them. The unique quality of his work, however, is his reliance on chromosome manipulation through the use of a chemical called colchicine. This substance, derived from the autumn crocus, has long been used by researchers to artificially double an organism's chromosome count, and in the case of roses, the doubling opens up a wealth of breeding possibilities.

"Every desirable quality you want is out there waiting," says Basye. His plants are a lifetime of attempts to capture premier rose genes.

On a tour of his 50 acres, the scientist doesn't show off his considerable efforts so much as downplay what he's done. "Every good rose has its bad points," he notes, and nothing he's accomplished, not even a splendid thornless shrub with the graceful form of an old blueberry bush, has suited him. "The flower's not exciting," he notes, dismissing it.

But uncharacteristically, Basye encourages Shoup to rustle. In the past, Shoup explains later, the rose breeder has consigned much of his work to the burn pile. In fact, it was from there that Bill Welch rescued two varieties, "Basye's Purple Rose" and "Belinda's Rose," neither of which met their creator's exacting standards. Both have become popular and much-praised items in the Emporium's catalog.

The clippers come out. The precious cuttings go into plastic bags. The newest "old" roses enter the horticultural pipeline.

A cemetery outside Anderson, Texas, is a typical "habitat" where rose rustlers recover antique varieties.

Bill Welch and Pam Puryear found this Old Blush in 1981; they took cuttings, which are now being sold.

Health insurance covered your surgery. Life insurance protects your family. Car insurance guards the old jalopy. Your homeowner's policy even protects the chair you're sitting in.

All you can lose is the nest egg that lets you sit there.

Can you insure your nest egg? Absolutely. Next time you buy municipal bonds, make sure they come with MBIA insurance. Whatever may happen to the city or state that issued your bonds—your checks keep coming. Both Moody's and Standard & Poor's give their highest rating, Triple-A, to bonds that we insure.

Our protection is very reasonable. For the average $1,000 bond, you give up less than five dollars in interest income per year. Speak with your financial advisor. Find out how MBIA can help to make your investments even safer than your easy chair.

Municipal Bond Investors Assurance Corporation, 113 King Street, Armonk, New York 10504

By Michael Webb

An architect at home in both the East and West

A product of Japanese tradition but versed in the classics of Europe, Arata Isozaki designs buildings that bring people together

For ten days in the winter of 1989, everyone in Barcelona watched a high-tech, slow-motion barn raising, as the great dome of the Sant Jordi Sports Hall was cranked up, an inch at a time, on its hilltop site high above the city. Three sections of a steel space frame 400 by 350 feet across had been built in a "collapsed" position. The center section had been assembled on the arena floor; the side pieces were lifted into the site by cranes and hinged to the center. While construction progressed, even the king of Spain stopped by to watch, bringing Britain's Queen Elizabeth with him. Finally, hydraulic jacks footed solidly on the stadium floor began their slow ascent, raising the structure 150 feet into the air.

The engineers held their collective breath, day after cold and windy day. "We were freezing to death, and we couldn't see the movement, but the tension was terrific," recalls one of them. When the dome reached full height, key pieces called tension bands were added to lock the roof into place. For an encore, a Spanish tele-

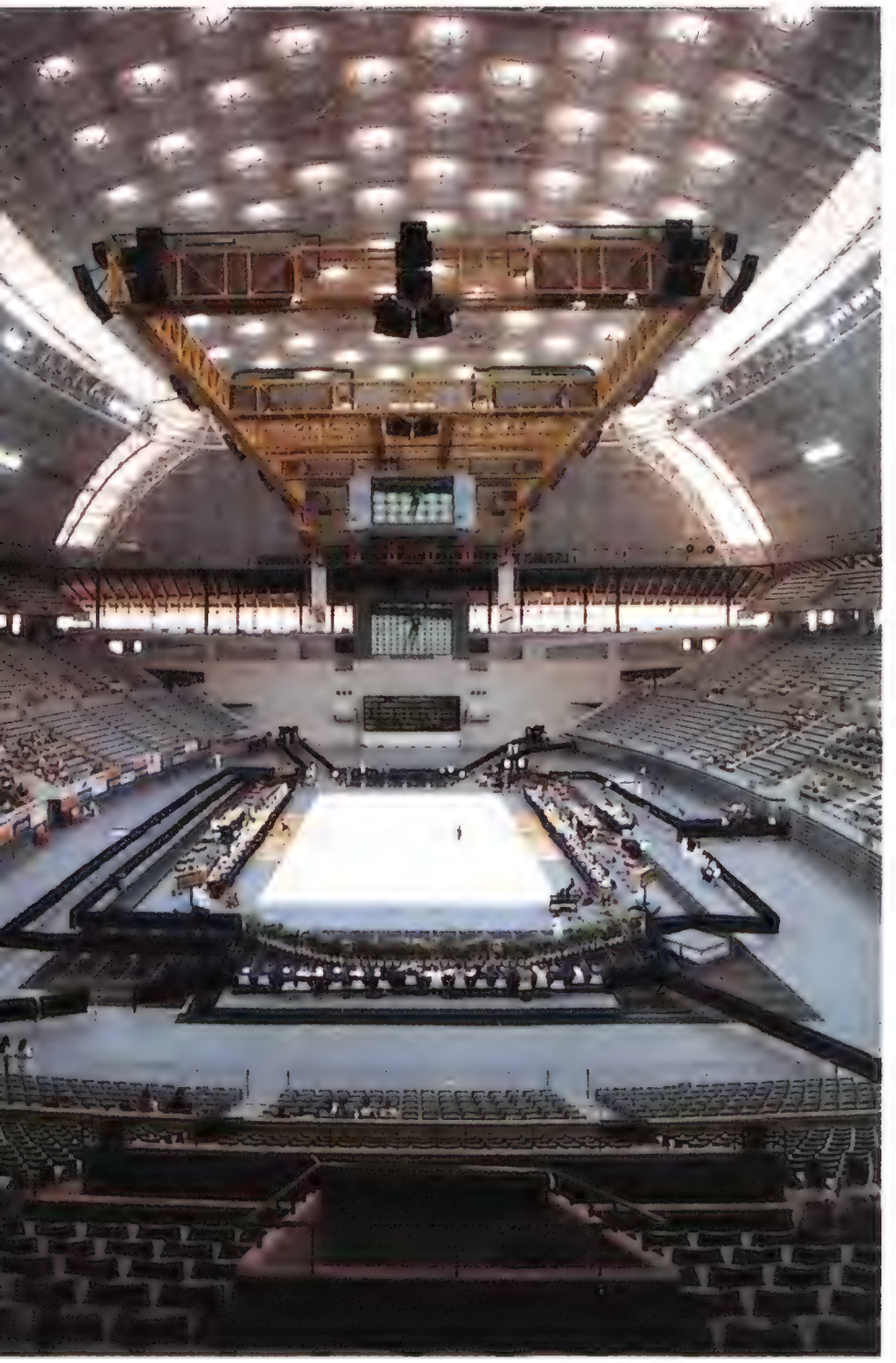
The Sant Jordi Sports Hall in Barcelona is ready for the Olympics; Isozaki (above) designed its dome so that it could be raised from a "collapsed" position.

vision station edited hours of time-lapse footage into a 25-second spectacular that was as exciting as the final dash of a winning athlete. By common consent, architect Arata Isozaki (above) shared the first gold of the Barcelona Olympics with engineer Mamoru Kawaguchi, who had pioneered the novel system of construction.

Thirty years ago, both men were assisting in the planning stages of two daring structures for the 1964 Tokyo Olympics. At that time, the 31-year-old Isozaki was working in the office of Kenzo Tange, the father of modern Japanese architecture. Isozaki had completed only one building on his own—in his hometown of Oita on the southern island of Kyushu—and he was undecided whether to pursue his career in architecture, or switch to art or urban planning. Today, at 61, the pupil has edged past his master as a creative force and role model. He juggles projects of every kind and scale—from houses to high-rises—with dazzling facility, yet finds time to write extensively about his ideas, design opera sets, organize museum exhibitions and provide opportunities in Japan for other architects from around the world.

Isozaki has become better known in this country in recent years because of two important commissions—the Museum of Contemporary Art (MOCA) in Los Angeles, which was completed in 1986; and the Team Disney Building, headquarters for the Florida Disney operations, completed just two years ago in Lake Buena Vista. But in Japan, Isozaki has been going like a house on fire (a simile that he would probably appreciate) for almost three decades. During much of that time he was considered an outsider; he has characterized himself as a "guerrilla" architect in comparison with Tange, whose early buildings blend beauty and power, and who put a lot of emphasis on the "social responsibility" of the architect.

The younger Isozaki, who was 14 when Hiroshima and Nagasaki were bombed, carries with him a knowledge that buildings are transitory and a gut feeling that the role of the architect is to create what he likes: to



Inside, the Sant Jordi hall seats 17,000 spectators; the roof, locked into a raised position with fasteners across its sections, allows for unobstructed views.

borrow freely from all that moves him and translate it freely into a pleasing place—pleasing not just visually but to all the senses of an individual moving through it.

And, like most of his projects, the Sant Jordi stadium pleases not only him but everyone else who enters. Isozaki won a 1983 competition to build the $80 million structure, which is his first European project and remains the largest building he has undertaken. For Isozaki, the surroundings—natural or man-made—shape his buildings. At first, he proposed an undulating roof that would echo the rolling hills behind the city. "I stood on the site and had this vision of a wave," he recalls. But engineering studies proved the idea to be impractical for so great a span. So instead, he thought in terms of a dome, turning to his colleague Kawaguchi to design what he had in mind. Kawaguchi's "Pantadome" system allowed Isozaki to achieve the airy lightness of a tent, and also gave him the flexibility to refine the curves of the roof and improve sightlines for the spectators with a subtlety entirely new in enclosures of this size. Light enters the space through skylights, which radiate from the corners and are cut through the central area of the dome, exposing the delicate structural tracery. Like a blimp, the building appears to be lighter than air.

Typically, Isozaki borrowed from both East and West for his arena design. The overall lines of the structure—the big roof, eave and secondary roofs—are related to traditional Japanese architecture. The long eave also suggests the kind of continuous wave he originally envisioned for the roof, a bow to the architecture of Antonio Gaudí, whose great unfinished Church of the Sagrada Familia now shares the skyline of Barcelona with the stadium. But it was to Gaudí's lesser-known Colonia Güell, with its canopies that create intimate spaces, that Isozaki turned for his inspiration. At the stadium entrance is a grid of steel-cable sculptures by Aiko Miyawaki, Isozaki's wife since 1973. With the arena's eave as a backdrop, they look like whimsical graffiti scribbles in the air.

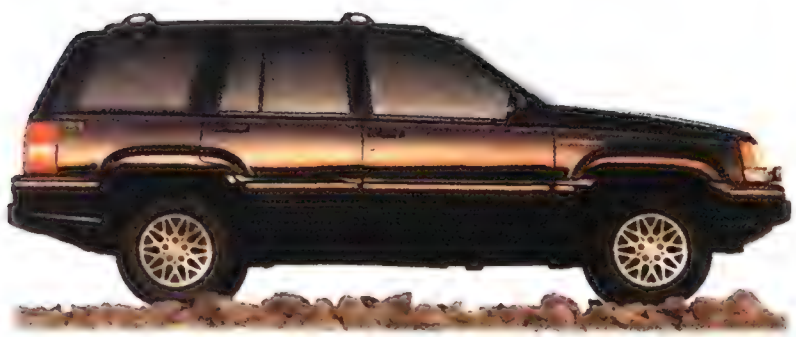
"I feel like one of the public"

When Isozaki designs a building, he continually keeps in mind the experience of a single person moving through its spaces. In a film produced by Michael Blackwood, he walks through the empty, recently completed arena. "I feel like one of the public," he says. It's as though his highest goal is to enter a building he has designed and forget that he created it, enjoying it instead as an individual with a small *i*.

But anonymity is hard for Isozaki in Barcelona these days. During a three-day open house for the city, he visited the site; over and over, he was recognized and warmly applauded. Later came the inaugural events—a

The World's Toughest 4x4 Is The Only One With A Soft Spot.

The New Jeep® Grand Cherokee Limited



There's Only One Jeep®...
Advantage: Chrysler

Chrysler's Owner's Choice Protection Plan includes: 7-year/70,000-mile powertrain protection or 3-year/36,000-mile bumper-to-bumper warranty. Your choice. And with no deductible. See limited warranties, restrictions, and details at dealer. Excludes normal maintenance, adjustments, and wear items. For further information about Jeep Grand Cherokee, call 1-800-JEEP-EAGLE. Jeep is a registered trademark of Chrysler Corporation.

Buckle up for safety.

OFFICIAL SPONSOR OF THE 1992 U.S. OLYMPIC TEAM 36 USC 380 U S A

For design of Los Angeles' Museum of Contemporary Art, Isozaki set curves against cubes; the curve in the foreground, like that of the chair back (right), was derived from Marilyn Monroe's contours.

basketball game that featured the New York Knicks, and a concert by Luciano Pavarotti. Already, the hall has taken its place among the landmarks of Barcelona. At night it glows from within like a UFO about to lift off. Later this month, a global television audience of a billion people will join 17,000 spectators in cheering the Olympic athletes.

Like MOCA and Team Disney, the Sant Jordi Sports Hall demonstrates Isozaki's mastery in balancing function and symbol, tradition and innovation, East and West. "My buildings are Western, but my body is Japanese," he declares. An American would agree: age has given him Buddha-like features; his gait is half samurai swagger, half Kabuki glide; and he wears softly draped monochromatic clothes designed by his friend Issey Miyake. But many potential clients in Japan have dismissed him as "too Western," as an artist and rebel who could not be trusted with major commissions.

Here, after all, was a man who wrote approvingly of the dream world of *Alice's Adventures in Wonderland* and the erotic curves of Marilyn Monroe, and who found inspiration in Palladian villas, ruins of all kinds and amusement parks. His intellectual curiosity, eclectic tastes and un-Japanese outspokenness were held against him. Like architect Frank Gehry (SMITHSONIAN, April 1987), he has preferred the company of artists to that of business leaders or government officials. He thinks of himself as a "citizen of anywhere . . . I love working anywhere at the same time, being free, responding to different situations in my own way."

Isozaki was the eldest son of a prosperous rice shipper, who was also a celebrated haiku poet and political dissident. Oita, where he grew up, is a small port city on Kyushu, and in those days before the bullet train and regular plane service, the island seemed remote from the capital. Almost every day, the young Arata went with friends to the ruined Shirasagi castle grounds to play—and to sketch. At 18, he entered the University of Tokyo, returning home frequently to draw strength from his roots. While still an undergraduate he joined Tange's studio, where projects ranged from the Olympic stadiums to schemes for futuristic cities in the air.

In 1960, Isozaki made his first trip to Europe. He planned to seek out the great examples of modern architecture, but instead found himself irresistibly drawn to the classics—the Campidoglio in Rome, the old medieval city of Siena, the villas of Palladio. "My

Michael Webb writes on architecture in the United States and abroad, and is developing television programs on contemporary Los Angeles architecture.

IMPORTANT NEWS FOR PATIENTS TAKING CARDIZEM® SR (diltiazem HCl)

If your doctor has prescribed Cardizem SR, you may be able to take new Cardizem **CD**. Cardizem **CD** contains the same medication as Cardizem SR in a new dosage formulation.

NEW CARDIZEM CD:

- SHOULD BE MORE ECONOMICAL
- IS EASIER TO TAKE

ASK YOUR DOCTOR IF CARDIZEM CD IS RIGHT FOR YOU.

For more information, and for a **FREE** quarterly issue of CardiSense℠, a newsletter on healthy living, call the following toll-free number:

1-800-424-6911

NEW

CARDIZEM® CD

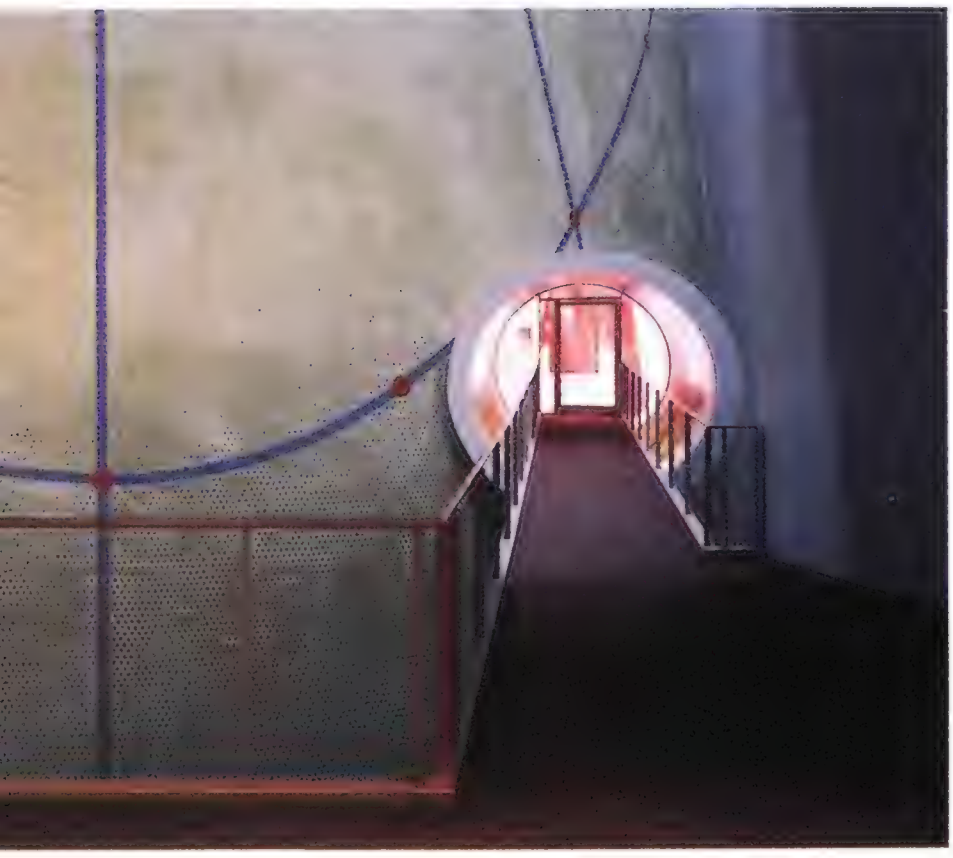
(diltiazem HCl)

MARION MERRELL DOW INC.
PRESCRIPTION PRODUCTS DIVISION
KANSAS CITY, MO 64114

©1992, Marion Merrell Dow Inc.

CCDAH072/A6391

6313C2



An intriguing hallway opens onto the funnel-shaped courtyard of the Team Disney building near Orlando.

The Disney building's two long office wings seem to collide at the middle in a mass of jumbled cubes.

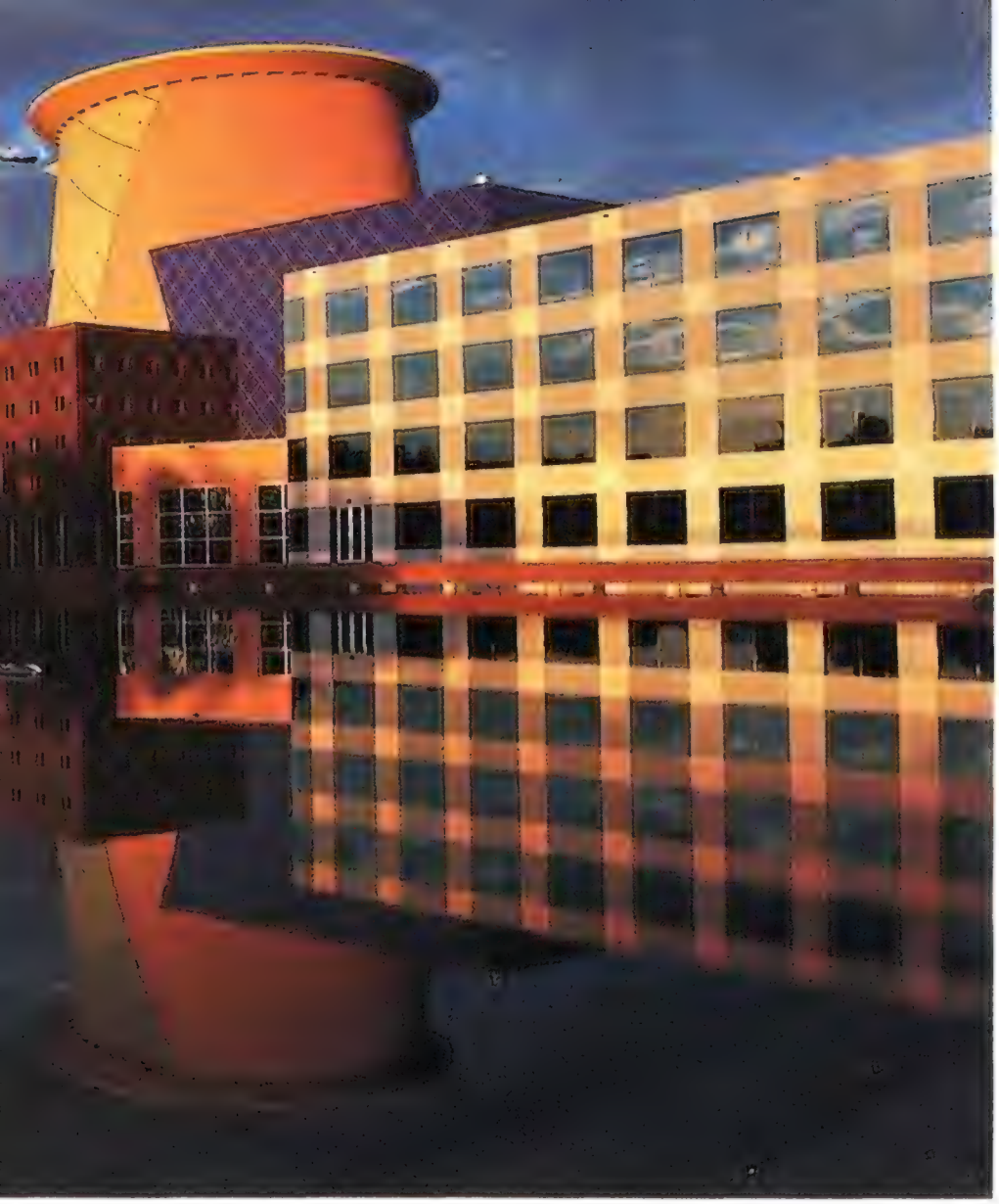
generation [of Japanese architects] is the first which has been able to look at, for example, the Parthenon, Chartres and the works of Palladio in the same way as we look at Japanese classics," he has said. "It's my generation's good fortune that we are able to learn from this situation."

In 1963, Isozaki opened his own studio in Tokyo. He had already completed one commission, which had come from friends of his father in Oita. The building, a medical center, is a muscular reinforced-concrete structure that looks like a fragment of the visionary cities he had been sketching in Tange's office. "The building is very vexing and awkward due in part to the crudeness of the technique," he later wrote. "I justified the presence of even those qualities, likening them to the note of lament characteristic of the jazz and blues I loved to listen to then." While designing it, Isozaki discovered something about himself. "I suddenly saw the building's resemblance to a piggy bank and burst out laughing," he remembers. "Instead of discarding the design I decided to go with it, precisely because of its humorous character. That was my first decision."

Since then, Isozaki's sense of humor and subtle irony have found expression in many of his works. For all of his buildings, Isozaki begins with an "image," an idea that conveys its spirit. It may be a metaphor: when he designed an exhibition hall for the port city of Kitakyushu, for example, he decided on the image of "water." The roof of the resulting building is suspended from steel cables and columns, creating a vivid metaphor of ships' masts. A small art gallery that was to sit adjacent to some railroad tracks became a metaphor for a train, its columned portico suggesting a locomotive, and its long rectangular body evoking boxcars. In a recent arts center for the city of Mito, just north of Tokyo, he played with the notion of gravity. A huge rock, showered by a continuous horizontal flow of water, seems to float in the air. Nearby, a high-tech tower of tetrahedrons rises 330 feet into the air (a reference to Brancusi's "Endless Column" of 1937), also seemingly in defiance of gravity.

Perhaps Isozaki's most surprising theme for a building was the one he chose for the clubhouse of a posh golf course near Oita. Isozaki couldn't understand why so many Japanese played this game, a recent import from the United States. He designed the clubhouse as a long barrel vault, which curves into the shape of a huge question mark, its dot represented by a small circular garden in the parking lot opposite the entrance. And people loved it.

They usually do. In 1967, when he designed a bank in Oita, an inspector from the Ministry of Finance was shocked by the bright colors and sprouting ventilation tubes, and complained to the bank's president. But the



View upward from inside the courtyard reveals it as a huge sundial, the shadow of its stylus cast on wall.

customers enjoyed coming in there so much that the bank's deposits shot up. Soon, other banks began to change their look.

Isozaki's prolific career has been punctuated by occasional personal crises. The worst came after he designed two giant performing robots for the Festival Plaza at Osaka's Expo '70, a celebration of Japan's economic recovery and technological prowess. That event should have been a triumph for him, but instead it provoked a physical collapse and spiritual crisis. Overwork was the immediate cause, but there was a deeper problem. It was a time of intense student unrest throughout the world, and Isozaki was torn between protesting against the system (his sympathies were with the students) and working on commissions from it. Two years before, in 1968, he had designed "Electric Labyrinth" for the Triennale art fair in Milan. Images of future buildings as ruins were projected onto a panoramic view of the devastated Hiroshima. It was Isozaki's ironic comment on the transitoriness of human creation; he was shaken when student protestors brushed aside such intellectual subtleties and occupied the hall on opening day. The stress finally caught up with him after Expo '70, and Isozaki withdrew, doing almost nothing for half a year.

The commission for the Gunma Prefectural Museum of Fine Arts in Takasaki, completed in 1974, gave Isozaki the fresh start he needed. Here, he shed the massive forms of his earlier work in favor of pure geometry. Preparatory studies show a skeleton of 40-foot hollow concrete cubes that resembles a minimalist Sol LeWitt construction. The exterior is a membrane of aluminum panels. One wing projects out at an angle into a reflecting pool, like a high-tech temple gate. The building, with its top-lighted galleries and grand white marble staircase, is an art object as well as a place to display art. Cool, elegant, cerebral, it helped bring Isozaki his first important job abroad: the Museum of Contemporary Art in Los Angeles (p.62).

It turned out to be a painful learning experience. The museum had to be shoehorned into a high-rise office development on Bunker Hill, a northward extension of the downtown financial district, and submerged within the parking podium so as not to block the views of a shopping mall. Visiting Los Angeles years earlier, Isozaki had noticed how featureless the city appeared. "Each [building] must create its own independent, symbolic self," he concluded, so he designed MOCA as "a small village . . . a piece of jewelry." Much time was wasted in defining the site, finding a new developer when the first went bankrupt, and fending off a museum trustee who demanded a plain container for the art. The mild-mannered Isozaki learned to show anger and to say no, even to consider resigning. He pre-

Visitors to the art center at Mito, Japan, completed in 1990, are welcomed by a 20-ton rock—its surface pummeled by water—that seems to defy gravity.

sented almost 30 designs—including one he publicly disowned—before reaching agreement with the museum committee on one he liked.

The finished product lends support to the romantic notion that great art is born of conflict. "Not since the French architectural visionaries of the 18th century has an architect used solid geometric volumes with such clarity and purity, and never with his sense of playfulness," wrote critic Joseph Giovannini when MOCA was completed in 1986. Isozaki turned constraint to advantage by grouping the galleries around a sunken courtyard. Walls of rough-textured red sandstone, a barrel-vaulted office block and pyramid skylights lure visitors from the street to the entrance. (The sandstone was brought from India; on an earlier visit to that country, Isozaki had been struck by the warmth of the abandoned Mogul city of Fatehpur Sikri, which is built almost entirely of that stone.) Within, says director Richard Koshalek, "he kept the pattern of circulation simple, but gave us a diversity of light and space, a setting for artworks of every kind." The galleries are all painted the same color; it is the change in natural light from room to room that creates differences in mood. Overall, mass is juxtaposed with void, and hard edges with soft curves.

One of the curves that he employed is his "Marilyn Monroe curve," so called because he came up with it by tracing over the actress' contours in a now classic nude photograph of her. From this silhouette, he developed a French curve that he used in designing the back of his "Marilyn-tosh chair" as well as in many of his buildings, including MOCA.

As MOCA neared completion, Isozaki and Tange bid against each other for the greatest prize Japan could offer. A limited competition was held for the design of a new Tokyo City Hall to replace the one that Tange had designed in the mid-1950s. The new three-block site in the brash Shinjuku district was hemmed in by commercial skyscrapers, so a huge and imposing building was requested. Everybody in Isozaki's office participated in the creation of a remarkable plan: a 23-story horizontal block in which offices and a spherical council chamber were deployed around an atrium, 1,000 feet long and 300 feet high, which was lit from a glass pyramid that rose from the roof. Isozaki envisioned the atrium as a huge gathering place for the people of Tokyo, a symbol of democracy in which the public servants would occupy subordinate spaces.

But Tange's design won. Isozaki bitterly described it as "just office towers . . . an ostentatious display of a craving for power." Many observers agree that Tange's towers are chilly and authoritarian, like so much of his work over the past two decades. They wish that Isozaki's plan had won: ten years before, he had designed a city hall for the remote mining town of Kamioka in the Japanese Alps, creating a functional space that also lifts the spirits of everyone who goes there.

"Tokyo is a distressingly ugly and chaotic city," Isozaki has written, "but it also possesses such mysterious vitality that building in it is a great challenge to an

architect." At the beginning of his career, he dreamed of soaring above this chaos; now he is confronting it head-on. Although he lost the city hall commission, he has won competitions to design a concert hall in Kyoto and a convention center in Nara.

Meanwhile, other Americans hired Isozaki during his four embattled years of work at MOCA; he created the Palladium nightclub in Lower Manhattan, and a house-gallery for art collector Theresa Björnson in Venice, California. He was also snared by Michael Eisner, CEO of the Walt Disney World Company, who was so inspired by MOCA that he asked the architect to design the headquarters for his company's Florida operations. Eisner has rivaled Renaissance popes in his enthusiastic patronage of leading architects, but most of them have been American, and few have escaped the trap of wanting, above all, to entertain. Would Isozaki also become a Mouseketeer? Initially, Isozaki's deference bothered the Disney executives. "Be bold, the sky is the limit, you can propose anything," they urged him. Isozaki returned with a scheme he likened to an ocean liner—a sleek, extended, four-story office with a huge funnel amidships, reflected in a pool: the flagship office for Disney Florida. Around the funnel is an assymmetrical cluster of brightly colored cubes. The collision of skylights, entrance lobby and related spaces creates a tremendous sense of expectation as one approaches the building.

But nothing prepares the visitor for the impact of the cylindrical courtyard. Druids would feel at home here. The theme is time, and the courtyard is an enormous sundial. Time surrounds the viewer as a bright yellow stylus casts a shadow across a calibrated wall of terra-cotta-colored stucco. The color seems to hang in the air; the acoustics are resonant. Stepping stones inscribed with quotations related to time by Shakespeare, Einstein, Donald Duck and other pundits are set in an expanse of old river stones like those that border Japanese temples. Offices for about 1,600 employees are ranged around the perimeter of a top-lighted atrium, which wraps around the sundial.

Even Disney chief Michael Eisner was reduced to an individual with a small *i* when he first toured the courtyard. Clad in baseball cap and Mickey Mouse T-shirt, he stood on the old, worn stones and clapped his hands together once. "Oh, wow!" he exclaimed. "It echoes not once, it echoes . . ." He clapped his hands again and listened, transfixed, as a subtle sound like the fluttering wings of a huge bird returned to him. He clapped a third time. He liked it.

Isozaki's 330-foot tower of titanium-clad, steel-framed tetrahedrons reaches into the sky at Mito Art Center.

The Cradle Of

First came very crude hand tools. Then cave drawings. Villages. An alphabet. And finally, two million years after the first *Homo sapiens* stood up straight, his descendants can now sit down.

Guess where.

The elaborately crafted driver's seat in the Lexus ES300 sports sedan offers 4-way power adjustments. And, beneath the optional fine-grain leather upholstery, both the firmness of the springs and the density of the padding are varied for additional comfort and greater lateral support for those spirited maneuvers

© 1992 Lexus, A Division Of Toyota Motor Sales, U.S.A., Inc. Lexus reminds you to wear seat belts and obey all speed laws. For more information, call 800-872-5398 (800-USA-LEXUS).

Civilization.

The ES 300

through tight turns (we are, after all, talking about a sports sedan).

But a seat is only as good as the cabin surrounding it. In this particular case, it is a Lexus cabin: noise- and vibration-dampening materials are extensively used to provide the hallmark Lexus quiet. And a 180-watt maximum power, 8-speaker premium sound system is furnished to subsequently shatter it.

Indeed, all that is currently missing inside the cabin is you. We suggest a visit to your Lexus dealer, where the two of you can further discuss the rise and recline of mankind.

LEXUS

The Relentless Pursuit Of Perfection.

By Doug Stewart

Petrified footprints: a puzzling parade of Permian beasts

New Mexico paleontologist Jerry MacDonald hunts fossil trackways of creatures who roamed near a great inland sea 280 million years ago

It's a clear, chilly morning in southern New Mexico's desolate Robledo Mountains, and Jerry MacDonald, panting as much from excitement as exertion, is hot on the trail of wild game. He's not quite sure what he's tracking, but he knows he wants it.

"Look at that little guy go!"

Too late. MacDonald's four-footed prey has vanished. It seems to have scurried straight into the sheer rock cliff rising up next to us. Only its tracks remain in the mud behind it. MacDonald, sweating in the 40-degree desert air, is off in pursuit.

"He's really moving. Let's see if we run into him up this way."

That the trail is some 280 million years old, and the mud now mudstone, doesn't dampen the thrill of the chase for MacDonald—a thrill that verges on bloodlust. The spritely creature he's hunting is an amphibian whose tracks he's never seen before; it may well be that no one has ever seen them before. With a loud grunt, he jams a six-foot pry bar into a fissure between two layers of red mudstone at knee level and starts rocking the end of the bar. Then he clasps his two meaty hands on the broken-off slab and begins to yank.

"I want this," he whispers to himself, breathing hard, as he struggles to free the rock. "Come on!"

At layer 25 of excavation, MacDonald brushes off some unidentified prints that appear curiously bipedal.

The slab finally comes free, a smooth chunk of heavy red-brown mudstone about the size of a small suitcase. Gasping, MacDonald heaves the slab up onto one side. Running the length of the top edge is a series of fine, parallel cracks. He pokes a chisel into the most prominent of the cracks and thwunks it with a small sledgehammer. The stone pops open.

The early-morning sun highlights a crisp series of footprints much larger than we were anticipating. They're almost an inch deep and several inches long from the back of the heel to the vicious-looking ends of the widely splayed toes. On this exact spot, long before the age of dinosaurs, a sail-backed pelycosaur known as *Dimetrodon grandis*, king carnivore of the Permian period, swaggered through this patch of now petrified mud. To MacDonald, panting and chortling as he sweeps rock debris from the impressions with his fingers, it's as though the reptile had just crawled out of sight, snorting and hissing.

Most museums would be happy with a single slab bearing a half-dozen Permian footprints. MacDonald has dug up and assembled trackways up to 27 feet long that contain an entire food chain's worth of footprints, whole feeding frenzies in stone. Until this morning, I've always regarded fossil hunting as slow, tedious and uneventful work. No longer. MacDonald is digging up footprints faster than I can jot down their descriptions in my notebook.

"It's so rich they wouldn't believe me"

"Jeez Louise! Another pelycosaur—a big one!" We're both laughing now. "Man, look at those claws! This layer is going to be spectacular." MacDonald wasn't expecting this; he was just clearing rock to get down to his target layer. I comment that he doesn't have to wait long for gratification. "Uh-uh. Not here." He stops prying and straightens up. "That's why people wouldn't believe me," he says, fixing me with an exhilarated glare. "It's so incredibly rich, they just wouldn't believe me!"

Jerry Paul MacDonald was headed for a PhD in sociology when he struck pay dirt in the Robledos years ago. Since then, his life has been consumed by paleontology—or, more specifically, ichnology, the collection and study of animal traces, including footprints. To say that hunting for fossilized footprints is MacDonald's hobby is like saying that Norman Mailer likes to type. MacDonald is *obsessed* with footprints. He dreams about them at night and fantasizes about them during the day. Though he remains essentially an amateur among professionals, the tracks he's unearthed singlehandedly at three dozen sites in and around the Robledos have attracted worldwide attention and aroused new scholarly interest in the Permian period, the last age of the Paleozoic era.

Photographs by Eduardo Fuss

"On a scale of one to ten," says James Farlow, an Indiana University fossil-footprint expert, "I'd give the Robledos findings about a hundred. They've got everything: reptiles, amphibians, insects, gorgeous plant fossils, even some bone beds, all in the same rock. It's one of the best footprint faunas of any kind, any age, anywhere." The slabs that MacDonald has been splitting open and hauling out may contain evidence of more than 100 different animal and plant genera, many of which appear to be new to the world of paleontology.

Bony fossils reveal what animals looked like, but they only hint at how they behaved. Fossilized footprints can offer an exact glimpse of what animals were doing at a given instant in time, almost as though a hidden camera had been running. What makes the Robledos footprints especially valuable is that they're not simply tracks, they're *trackways*—long, unbroken trails of animals of all kinds, sizes and dispositions, walking, darting, swerving, pouncing. Many of the footprints are so sharp, the mud appears still wet. Yet they are almost unimaginably old: they were imprinted not long after (in geological terms) the first animals slithered out of the sea.

The discovery of Pelycosaur Heaven

Back in 1987, the year MacDonald began discovering trackways, his key site, now dubbed Pelycosaur Heaven, was just a smooth-sloping expanse of gravel and undistinguished rock debris. Since then, MacDonald reckons, working with simple hand tools and his bare hands, he's dug, scraped and pulled 100 tons of rock out of the hillside. Twenty-five of those tons were collectible trackway specimens that he tied to his back and lugged out for eventual cataloguing and analysis. (All of his excavations are on federally controlled land. None of the sites are accessible by road, nor has he publicized their exact whereabouts, the better to deter fossil thieves.) "The biggest slab I ever carried out weighed 175 pounds," he says. "That was a real killer." The slab contained pristine footprints of what was probably a ten-foot sail-backed pelycosaur. MacDonald roped the slab to his back and spent two hours staggering the half-mile to his Jeep. "For the final climb out, I was on my hands and knees." As a result of his one-man quarrying operation, MacDonald now suffers from permanent ligament damage in his shoulders, fallen arches and so much nerve damage to his heels that he can't feel a pinprick in either one.

MacDonald is obviously a highly motivated individual. At 5 feet 8 inches tall, he's not a large man, but he's sturdily built. He has the untamed look of a modern-day mountain man: broad, weathered face, unkempt beard, intense wide-set eyes. A former high school gymnast (springs, flips and handstands were his specialty) and later a recreational weight lifter, MacDonald approaches his fossil hunting with the mind-set, the training and the solitary self-discipline of a heavy lifter. Yet to take him for a blue-collar workhorse would be a mistake. He's both a dreamer and a detective, a quiet observer who, in his mind's eye, pictures the Permian shards he finds and constantly tries to complete them. He may at times be unsure of his taxonomy, and he may stumble over the requisite paleojargon, but as a crafty hunter of Permian wildlife he is unsurpassed. "Jerry's intelligent, tenacious and very honest," says Nicholas Hotton, a curator in the Smithsonian's paleobiology department. "He hasn't just hauled the rocks out. He's curated them. The catalog of trackways that he's completing is just as good as one you'd get

from a professional." The Smithsonian's Museum of Natural History (which now houses a 20-foot trackway that MacDonald excavated) has given him a collaboratorship, and the federal Bureau of Land Management and the Los Angeles County, Carnegie and New Mexico museums of natural history support his fieldwork. To display his finds, the BLM has plans to put up a Permian trackways museum near his main site. There is even talk of designating as a national monument a five-square-mile region encompassing his excavations.

Despite the widespread excitement his discoveries have generated, MacDonald continues to do his fieldwork alone for the most part, as he always has. Most mornings, he rouses himself before dawn, packs a canteen and some trail mix, and heads from his home in Las Cruces into the mountains. On a recent visit to his key excavation site, we leave his battered 1958 Jeep near a flagstone quarry and cover the last half-mile on foot, picking our way through arid ravines studded here and there with sagebrush, yucca and prickly pear.

The excavation comes into view as a horizontal red scar gouged into the base of a steep ocher-colored hillside. Up close, it's a man-made, neatly terraced cliff 20 feet high and 120 feet wide, with alternating layers of mudstone and siltstone. "Of the major layers, this is layer 25," MacDonald tells me as we walk out onto the stone floor of the excavation area. Plainly visible between our feet are footprints almost an inch deep that look uncannily like large human hands. A giant reptile or amphibian of some kind left the tracks, but so far, no

Trackways reveal interaction of Permian denizens in artist's view of tidal mud flats 280 million years ago. Sail-backed dimetrodons and sister sphenacodonts, like green one with its young, are at top of food chain. Bulky, six-foot-long amphibian eryopids hang out at pool looking for lunch, as does orange varanosaurid. Spotted diadectid, perhaps largest of all Permian beasts, is a vegetarian, so the araeoscelids in back are safe.

Tracks in the mudstone (clockwise from top left): eryopid, an alligator-like amphibian; sphenacodont, a seven-foot-long predator; unexplained bearlike tracks; an araeoscelid, a slender reptile; footprints and tail-belly drag of a diadectid; an eight-inch centipede.

one who's had a chance to see them knows what it was.

Among the mesquite bushes below the quarry he's pieced together mosaics of track-bearing slabs that are too heavy to lift. They await the arrival someday of an all-terrain vehicle. MacDonald scrambles over the trackways, giving me a guided tour of his alfresco art gallery. "See this little sweetheart here?" he says, crouching to run a finger along a trail. "You can see its tail drag. That's probably belly drag over here because this little deary is quite a bit wider." MacDonald is as smitten by the tiny critters as by the big ones. Crawling over the mosaics, he delightedly traces dozens of faint centipede tracks and points out landing traces made at random by flying insects. Like carbon paper, the fine-grained mudstone records every detail. Even the weather is preserved: one slab is pitted with hundreds of shallow craters—raindrops.

The smooth, almost wet-looking, surfaces of all these slabs were once the tranquil shoreline of a vast inland sea, MacDonald explains. The waning tide would leave water bugs and small shellfish exposed on the mud flat, where small reptiles and amphibians would feed on them. Larger predators, ranging from carnivorous pelycosaurs a couple of feet long up to *Dimetrodon grandis,* 12 feet in length from fangs to tail, would then pick off anything smaller and slower than they were. "It was like a restaurant," MacDonald says, "the hottest one in town. Everybody came."

Incoming tides and rain-swollen streams would regularly bury the still-fresh footprints of prey and predators in new layers of mud or silt. (Skeletal remains are rarely found in the same sediments. Bones are best preserved by a quick, catastrophic burial, Pompeii-style.) The layered rock outcrop 20 feet high that MacDonald has excavated here is not a steady accretion of sediments over 280 million years, but rather a record of a relatively brief period of calm shoreline deposition; sedimentologists surmise that the bottom

Doug Stewart, a regular contributor, reports that for sheer excitement he now ranks paleontology right up there with race-car driving and slam-dancing.

You *know* that the hole in the earth's protective ozone layer is caused by chlorofluorocarbons—CFCs. And you know that a major source of CFCs is found in the cooling elements of refrigerators and air conditioners. What you may not know is that a major solution can be found in air conditioning that runs on natural gas. Because the technology behind commercial natural gas absorption cooling does *not* use CFCs. It uses simple salt and water. And that's just one of its advantages. Natural gas cooling often costs less to operate than electric cooling. If you'd like to find out more about natural gas air conditioning, talk to the experts at your local natural gas company. In times like these, they're well worth looking up.

There's a hole in the sky!

© 1992 AMERICAN GAS ASSOCIATION

Use natural gas. We'll all breathe easier.

layer was laid down 10,000 years at most before the top, a blink of an eye in geological terms. Much later, after the mud had turned to rock, violent tectonic upheavals twisted and buckled the sediments, eventually thrusting them nearly a mile high. "It's rare to find the ancient shoreline unbroken like this," MacDonald says. "That's what you need to get these rich deposits of trackways." Of the 25 consecutive layers he has excavated here, he's found tracks of some kind in every single one—an unabridged encyclopedia in stone.

Today, after five hours of tracking his "sweethearts," MacDonald slides three of the day's finds into his knapsack, and we hike to the Jeep. Later, at an outdoor Mexican restaurant on the outskirts of town, he tells me about how he came to discover Pelycosaur Heaven. In the mid-1980s, MacDonald was a late-blooming earth sciences major at New Mexico State University here in Las Cruces. (A college dropout, he'd worked as a cabinetmaker in Oklahoma for ten years, raising three children with his wife, Pearl, before moving to Las Cruces in 1983.) As he knew from college field trips into the Robledos, rocks with a few eroded footprints sometimes washed down from the hillsides after heavy rains, but the tracks were typically small and indistinct. No one had ever tried to dig out tracks systematically, let alone whole thoroughfares of them. "I was new to the area," MacDonald recalls. "I wanted to find a footprint for my collections." He talked to local fossil hunters and visited quarries where workers often discovered rocks containing well-defined footprints. In fact, they set them aside for ornamental jobs—patios and fireplaces especially.

In his Quonset hut lab, MacDonald classifies trackway fragments after painstakingly piecing them together.

The restaurant we're sitting in, Guacamole's Patio Pick-Up, is a case in point. MacDonald points out an impressive set of claw marks from a prehistoric reptile in the flagstones next to the takeout window. The low afternoon sun is right for track hunting, as it happens, and MacDonald interrupts his story for a little preprandial sleuthing. Wandering among the diners, he notices something on the floor that would be invisible if the sun were any higher: a series of unusually thin four-toed footprints an inch long. "I don't think I have that one," he says, squatting excitedly between the picnic tables; "those are really nice." A diner offers to move if MacDonald plans to dig them up. "No, but I'm going to get my camera," he replies.

Later, MacDonald recalls how his whim became an obsession. In the spring of 1987 he was taking night classes at NMSU toward a master's degree in sociology, so his days were free for prospecting. He'd collected a few scattered tracks by then, and had resolved to begin a methodical search for rock formations that suggested a meeting of sea (limestone) and land (sandstone), reasoning that the ancient shoreline was the likeliest repository of buried footprints. Three or four mornings a week for six weeks he trekked through the hills chipping samples, finding a small track here, a small track there. "At the end of each day, I was ready to give up." But at night, MacDonald dreamed of sensational trackways stampeding across the arroyo floors, trackways as perfectly inscribed as the day they were made. The next day, he'd be out cracking rocks again.

"It was like opening an Egyptian tomb"

Finally, one morning in June, he dragged a 120-pound slab of coffee-colored mudstone out of a hillside and cracked it open with his rock hammer. "It was like finding and opening the door of an Egyptian tomb," MacDonald says. Inside were five consecutive pelycosaur tracks, exquisitely preserved, each seven inches long. That slab turned out to be a small part of the longest trackway of Lower Permian pelycosaur footprints ever found. "I didn't even know what a pelycosaur was, but I knew I had something of worldwide significance," he says.

Bold! Brassy! Beautiful!

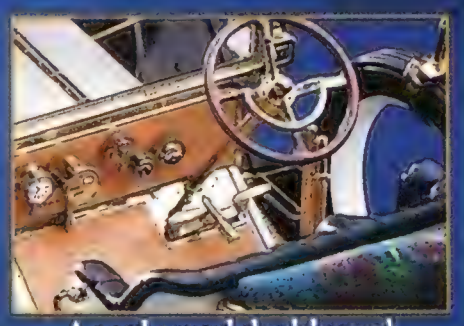
Shown approximately actual size of 8" long. Scale 1:24.

The 1912 Packard Victoria Model 1-48. The ultimate American luxury car from the golden age of motoring—in a spectacular die-cast model.

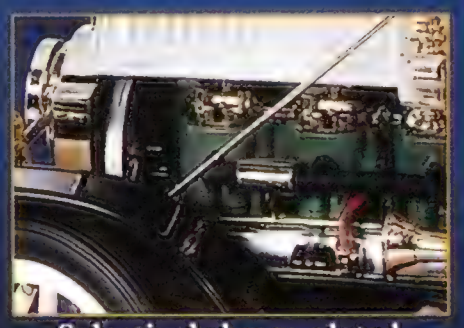
It set the standard for automotive luxury back in that golden age when brass symbolized value in an automobile. Today, it is among the most highly prized of all antique cars.

And now it is re-created. In a precision-crafted die-cast scale model officially authorized by the Heritage Plantation of Sandwich Antique Automobile Museum on Cape Cod, Massachusetts. A model so rich with detail it has spoked artillery wheels, doors that open and close, tufted upholstery that "gives," a spare wheel, a tool box, a luggage trunk—and a crank handle you can turn!

Side lanterns, headlights and grille are all plated with polished brass. And there's even a lap blanket in the back! All for just $120.



A real wood dashboard with steering and wheels that work.



Selectively brass-plated, the engine is produced in "Packard green."

RETURN ASSURANCE POLICY

If you wish to return any Franklin Mint Precision Models purchase, you may do so within 30 days of your receipt of that purchase for replacement, credit or refund.

Franklin Mint Precision Models.® Simply Miles Ahead.

Please mail by July 31, 1992.

Franklin Mint Precision Models
Franklin Center, PA 19091-0001

Please enter my order for the die-cast replica of the 1912 Packard Victoria Model 1-48, to be crafted in the classic 1:24 scale and sent to me hand-assembled, hand-polished and ready for display.

I need SEND NO MONEY NOW. I will be billed for a deposit of $24* when my specially imported model is ready to be sent to me, and for the balance, after shipment, in 4 equal monthly installments of $24*

**Plus my state sales tax.*

SIGNATURE _____
ALL ORDERS ARE SUBJECT TO ACCEPTANCE

MR/MRS/MISS _____
PLEASE PRINT CLEARLY

ADDRESS _____ APT. # _____

CITY _____

STATE _____ ZIP _____

© 1992 FMPM

13248-102

MacDonald's sturdy 1958 Jeep (note the license plate) takes the rough road to Insect Hill site in stride.

That day, the search became an excavation. Excited though he was, he resolved to operate methodically. That meant conscientiously excavating the 12 feet of rock lying on top of the discovery layer, starting at the top rather than simply diving into the hillside. "I started getting other trackways right away," he says. "Layer 3 had good stuff. Layer 4 was spectacular." He worked every day that summer, even weekends, when Pearl and the children would join him. They spent the next school year at the University of Virginia, where MacDonald had arranged to begin work toward his doctorate in sociology, but his heart was in the Robledos. That spring he returned to trackway hunting full time. Nineteen months passed before he was able to pick up the pelycosaur's trail in what turned out to be layer 10 (a trail that continued for 25 feet).

After lunch MacDonald takes me to the Southern New Mexico State Fairgrounds just outside Las Cruces. There, most of the rocks he has collected since 1987 are stored in three small buildings. One of them is an old padlocked Quonset hut where every inch of floor space is covered with rocks. The rocks, in turn, are covered with tracks—hundreds and hundreds of waddling, scurrying, slithering tracks. "Aren't these things neat?" MacDonald asks. "I'm just so in love with this stuff. They're like my children. Look at this little guy." He picks up a loose slab. "See the suction cups on the ends of his toes?" In one corner is a large tray he uses for comparative trackway research: he spreads baking soda over the bottom, drops live lizards, beetles or centipedes inside, then scoops them up and studies the patterns they leave.

The fossil tracks that MacDonald has collected include a number of what paleontologists like to call "problematica." On one trackway, for example, a three-toed creature apparently took a few steps, then disappeared—as though it took off and flew. "We don't know of any three-toed animals in the Permian," MacDonald points out. "And there aren't supposed to be any birds." He's got several tracks where creatures appear to be walking on their hind legs, others that look almost simian. On one pair of siltstone tablets, I notice some unusually large, deep and scary-looking footprints, each with five arched toe marks, like nails. I comment that they look just like bear tracks. "Yeah," MacDonald says reluctantly, "they sure do." Mammals evolved long after the Permian period, scientists agree, yet these tracks are clearly Permian.

Rumors that he'd carved the tracks himself

MacDonald feels there must be a plausible explanation. These may be creatures whose gaits are unknown; or an animal's back feet may have obliterated its front footprints; or a running five-toed animal may have grazed the mud with only its middle three digits, then been gobbled up on the hoof, as it were. MacDonald himself believes that there were neither birds nor bears in the Permian period (although he tries to stay open-minded about such things). He suspects, however, that conventional theories about precisely who was walking around in Permian times, and how they did so, will end up being revised, perhaps extensively, once these tracks are studied in detail.

On our way out of the Quonset hut, I linger over a tiny reptile trackway. I can see where mud has squooshed up between the animal's toes. The footprints are so fresh and finely detailed, I remark, they look sculpted from clay. "Please don't say that," MacDonald says. When he first began showing a few of his finds around New Mexico, he recalls, some of the local rock-and-fossil hounds were uninterested, even dismissive. He later learned that rumors were circulating that he was exaggerating his finds, that he might be clumsily destroying fossil beds, even that he'd carved all the tracks himself. "It was really discouraging," he says. "Then Pearl said, 'Jerry, take off your paleontologist's hat and put on your sociologist's hat.' " MacDonald is familiar with paleontology's rich history of feuding and backbiting. Instead of giving himself ulcers, he resolved to use the experience as data for his eventual doctoral thesis in sociology (a discipline he intends to return to before he cripples himself for good, hauling rocks).

Over the next few days, in other canyons north of town, it becomes clear to me that MacDonald hasn't

been carving these things by hand. I watch him repeatedly pull slabs of mudstone from eroded outcrops and then, with astounding frequency, erupt with glee as he finds biological time capsules buried inside. At a site he calls Insect Hill, I see revealed in the space of 20 minutes what is perhaps a diadectid, a formidable, 700-pound land animal with large, blunt feet; a 12-member centipede party; a mysterious scurrier whose long claws somehow leave S-shaped furrows ("I have no idea what that is"); and a gorgeous trackway, which might be from an eryopid, an alligator-like amphibian, complete with tail drag. "*Too* many good things," MacDonald laments. "They're everywhere."

During a later prospecting trip through the nearby Doña Ana Mountains, MacDonald leads me up a dry arroyo and points out a long row of ancient petroglyphs. Local scholars believe they were carved by native desert dwellers about the time of Columbus. We scramble up the slope to examine a turtle, a rabbit, a deer, a hunter with a bow and arrow—all simplified but clearly identifiable and anatomically correct, opposable thumbs and all. On a single block of sandstone is a large figure MacDonald calls Godzilla. Its face is featureless except for a beaklike nose and mouth. Below its head are patterns of mountain peaks and a spiral shape that, according to local lore, has spiritual significance. Inside the spiral is a mysterious footprint.

"Four toes," MacDonald says. "There's no animal around like that now." Some of the Permian amphibians, however, had four toes. MacDonald claims no expertise in petroglyph interpretation, but he's learned that local Indian legends spoke of spirit-animals that could walk inside mountains. He's found what he thinks are eryopid tracks within a stone's throw of here; the canyon is full of them. He suspects that the natives of 500 years ago may have been as enraptured by the magical subterranean trackways as he is and wove legends to explain the creatures who made them.

For MacDonald, too, this fascination with trackways has its spiritual side. "When you split open a slab and find tracks, you're the first human being to see them," he says as we hike back to the Jeep. "These animals are all extinct now." When he studies his trackways, he sometimes feels he has set foot alone in a vanished world. He knows it wasn't simply luck or the grace of the gods that led him to his discoveries; he used clever detective work, a well-trained eye and a lot of muscle power to roll back the door of the tomb. But he knows he's been lucky, too. He points to our footprints on the sandy floor of the arroyo. "Imagine how likely it is that any one of them will be preserved 280 million years from now." Yes, he says, he's been awfully lucky.

Strong will and a strong back push MacDonald as he carries 120-pound mudstone slab of fossil trackways to Jeep half a mile away. He's hauled tons of rock over the years; he says his back is fine but his feet, a mess.

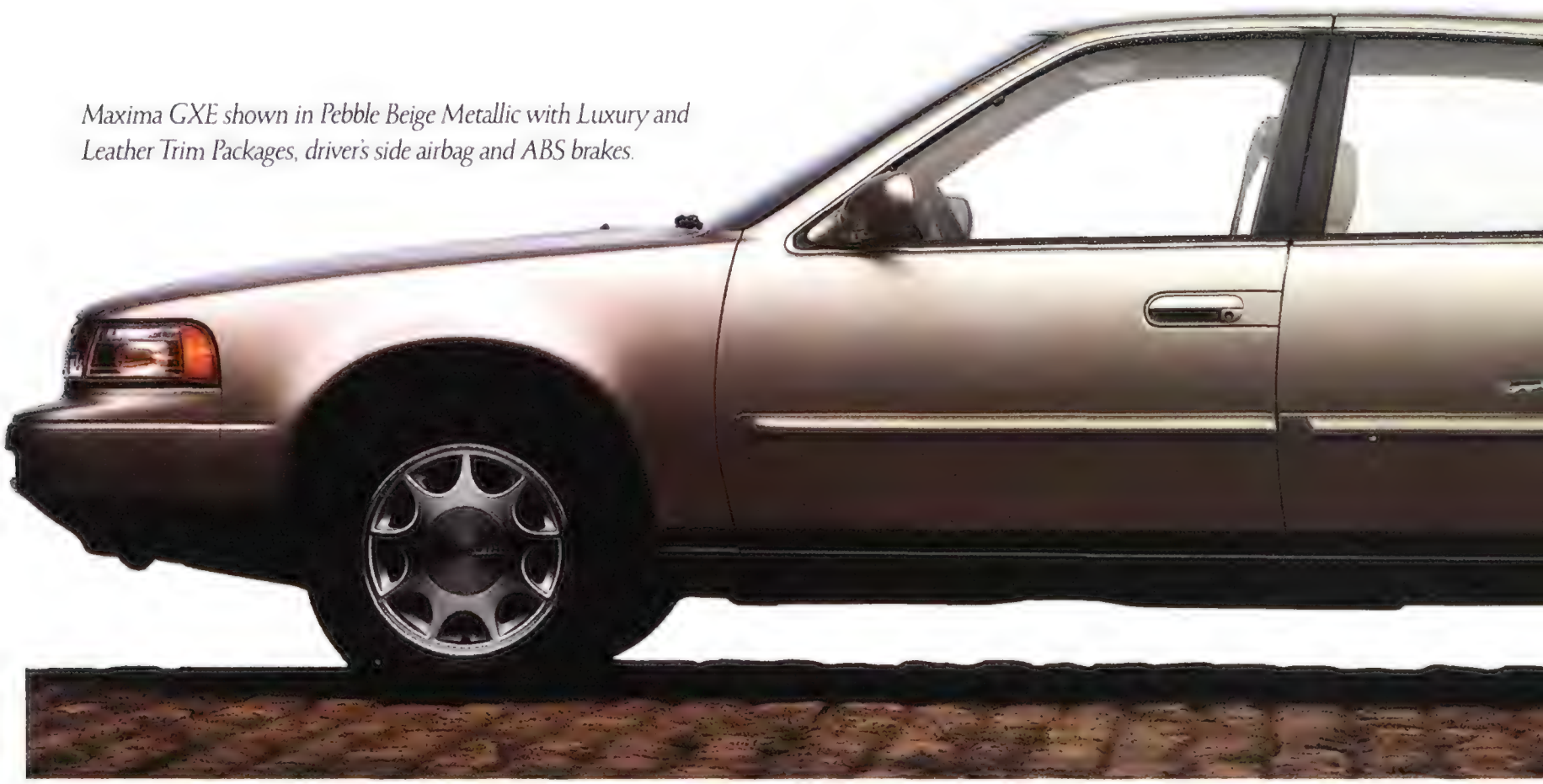
YOU FIGHT THIS CONSTANT
FISCALLY RESPONSIBLE AND
CONSIDER THIS

Today, the idea of spending thousands of dollars more on a luxury sedan for the cachet of having a hood ornament appears hopelessly unjustified.

No, these are the nineties, an era of renewed sensibilities. And instead of driving a sedan that demonstrates how wealthy you are, many of you are electing to drive

We believe some things in a luxury car should never be considered a luxury; like the safety of its occupants. Which is why the Maxima GXE offers such items as optional ABS brakes, optional driver's side airbag and a Digital Touch Entry System

Maxima GXE shown in Pebble Beige Metallic with Luxury and Leather Trim Packages, driver's side airbag and ABS brakes.



NISSAN *Nissan Motor Corporation in U.S.A. *Based on comparison of suggested retail resale price versus original M.S.R.P. as reflected in each of the Kelley Blue Book Western Editions from May 1991.*

BATTLE BETWEEN BEING REWARDING YOURSELF.

A TRUCE.

a sedan that shows how smart you are.

The Nissan® Maxima® GXE.

It offers all the amenities you would expect to find in sedans costing twice as much: including a Digital Touch Keyless Entry System, air conditioning, power windows and door locks, AM/FM cassette with Dolby,® a sophisticated theft deterrent system and optional equipment, such as a power sunroof, 4-way power adjustable driver's seat, compact disc player and seating surfaces appointed in leather.

Of course, what's under the hood is no less impressive. There you'll find a sequential, multi-point, fuel-injected 160 horsepower V6 that will ensure our interior doesn't make you too sedate.

If all of this is making the rational, right-side of your brain start to protest, consider that our '89 GXE has retained more of its original suggested price than either the '89 BMW 525i or the '89 Acura Legend Sedan.*

All of which suggests the only inner battle you'll have to face now is what color to pick.

NISSAN®

BUILT FOR THE HUMAN RACE.®

February 1992. Call 1-800-NISSAN-6 for more information. Smart people always read the fine print. And they always wear their seat belts. Dolby is a registered trademark of Dolby Laboratories Licensing Corp

Early in 1836, Mexican Army moved to quell revolt in Texas, which wanted to be a separate Mexican state.

By David Nevin

'Fight and be damned!' said Sam Houston

At San Jacinto in 1836, Texans beat back Santa Anna, and without really knowing it, we were all headed for sunny California

The flickering images build swiftly, from settlers with children and cattle and hay wagons, to settlers-turned-revolutionists taking up weapons, to columns of marching men, soldiers with rifles, cannon exploding, screams, men firing, falling wounded, some waving flags of victory, others dying in awful windrows. Behind a glass wall at the rear of the room, 42 slide projectors massed in banks and controlled by computers flash and rattle as they fire still images so rapidly as to produce a jerky motion that emphasizes the terror and wonder of the story they tell. Gradually the images calm, the battle ends, the sun comes out, the focus returns to today.

Fourth-graders from Dunn Elementary School in Houston, Texas, sit enthralled, eyes fixed on the 26-foot-wide screen, with mouths still agape. The lights rise in this 160-seat theater newly built in a wing of the San Jacinto Museum of History that commemorates the battle. The show itself, which includes all of the paintings on these pages, is a modern form of monument, and obviously they liked it. But why? Out of a cacophony of answers, Ashlea Brenek, a sprite of a 9-year-old with a vivid smile, sums it up: "Because it's our

At Gonzales, Texans defied Mexican demand to return a cannon first given them to resist Indian attacks.

story! All of us!" Intuitively, she has gone to the nub of a great geographic story that extends far beyond this museum. For it was here, on the original battleground just east of the modern city limits of Houston, during a dramatic 18 minutes on an April afternoon in 1836, that a decisive phase of the country's westward expansion began. That single, swift and totally surprising battle set Texas free from Mexico, and ultimately led to the shaping of much of the American West as we know it today.

The battleground museum forms the base of an obelisk brashly modeled on the Washington Monument, but in the Texas manner—almost 15 feet higher and topped by a bulky limestone star. Texans like to feel they are a little bigger, swifter, wilder, tougher, and often they are. And in some ways no man represents them better than the man whose monument this is—Sam Houston of Tennessee and Texas.

At dusk on March 11, 1836, the first rumors of disaster reached General Houston. He was at Gonzales on the Guadalupe River 70 miles east of San Antonio with fewer than 400 men, and the Alamo had fallen (SMITHSONIAN, March 1986). Gen. Antonio López de Santa Anna, chief of Mexico's army, an elected president turned dictator, had marched 5,500 polished troops into Texas (then part of the huge Mexican state of Coahuila y Texas) to punish rebellious Mexican and American settlers.

Houston viewed the Alamo as a death trap. He had ordered its defenders out, but they stayed anyway, 189 men facing 30 times their number. By March 11, the Mexican guns that pounded the Alamo's walls had been silent for nearly a week. Houston pondered the few options now open to his own tiny, untrained army. The Texans were settlers, Indian fighters, tavern scrappers, ferocious when roused but absent any glimmer of military discipline or skill. These men, another 400 some 55 miles to the south at Goliad, plus the men in the Alamo, if they still lived—call it a thousand—were now on hand hoping to drive Santa Anna from Texas.

Scouts brought in Mrs. Susannah Dickinson, 21 years old, clasping a sleeping child in her arms. She told how Mexican soldiers had poured over the Alamo's walls in blue waves, killing every man they encountered. All 189 were dead, their bodies burned. Santa Anna had summoned the young Mrs. Dickinson and

Illustrations by Charles Shaw

Downcast Houston bows head as, camped near the Guadalupe River, he receives news of the Alamo and deaths of all the men in it. He had ordered it abandoned, but he was disobeyed.

As word about the Alamo spread, panic set in. Some deserting soldiers, many settlers and the provisional government of Texas frantically headed east, hoping for refuge in Louisiana.

Closely pursued by Mexican soldiery, the Texas president, David Burnet, and some of his cabinet managed to make their escape in a small sailboat across Galveston Bay.

sent her east with a message: this was what all rebellious Texans could expect. And, she warned, the Mexican general was already on his way.

After listening to this, the Texans were bursting with fury, sharpening their knives, tamping fresh loads into long rifles. They would smash Santa Anna or die trying! Houston, meanwhile, walked the camp, saying little, his roll of maps under his arm. That night, he ordered his men to break camp and march east. East? Away from the enemy? Retreat? Turn tail and run from the killers?

Suspicion took hold, suspicion that would grow to a furious conviction: they were marching under a coward or a traitor. Who was this man who had been elected to command them?

Above all, he was different from them. He was a soldier among amateurs, a sophisticate, at home in tavern or drawing room as well as among Indians and settlers whose horizons reached not far beyond their own farms. He was a striking figure, his stalwart height, 6 feet 2, habitually exaggerated in recollection. He was different in another way, too, a man who held himself aloof so that even close friends found him unpredictable. This was partly political skill, the shielding of intentions to keep options open, but it went far beyond calculation, a sign of some inner gravity.

Some of his quality grew from the pain of a bruised heart. The bruises mattered, for he was a changed man after the disaster that had brought him to Texas back in 1832. Before that he'd earned Gen. Andrew Jackson's affection as a courageous young Army officer, then switched to law and a career in Tennessee politics—where he was elected major general of the militia, then Congressman, then governor. His relationship to Jackson was almost filial.

But when he was 35, standing for a second term as governor, Houston's marriage collapsed. For reasons neither of them ever revealed, his wife fled to her parents in a very public way. Divorce was almost unknown then, and this produced a roaring scandal. Everyone agreed some great marital crime lay behind it—but was husband or wife guilty?

Houston refused all explanations, resigned and left Tennessee. Early in life he had lived with the Cherokee chief Oo-loo-te-ka and become his adopted son. Now he joined his Cherokee family, which was then subsisting on the Arkansas frontier. For the next few years he dropped from sight.

But in 1832, just shy of 40, he rode into Texas. It was a natural move, Texas in the 1830s being a lodestar for the American imagination. It was the place to go for a new start when your heart was broken or your purse was empty or the law was asking questions.

The colonies there were well established. Soon after 1821, when it won independence from Spain, Mexico was accepting American immigrants to parts of Texas that neither it nor Spain had managed to settle fully. Thereafter, the Mexican government was too busy with post-revolutionary turmoil to notice growth in Texas. When the Mexicans awakened, they discovered more than 20,000 Americans who felt they owned the place, and who also practiced slavery—something Mexican law prohibited. Texans were outraged when Mexico tried to limit further growth. In a series of skirmishes, settlers defeated weak garrison troops. But a new figure was rising in Mexico, slowly consolidating power.

As the experienced commander of Mexico's army, Antonio López de Santa Anna had made himself a national hero when he routed a final Spanish attempt to regain control and then ejected a dictator who had seized the new national government. Santa Anna posed as an ardent democrat, and a grateful nation swept him into the presidency. Then his true nature began to emerge.

Women, opium and murderous intrigue

A tall, broad-shouldered, handsome man a year younger than Houston, as adept at politics as at war, Santa Anna was a devious libertine with a well-developed taste for women, pomp and murderous intrigue. He liked opium, too, but his real addiction, far more dangerous, was power. "If they could make me God," he once cried, "I would still want something higher!"

Step by step he revealed himself as a more able dictator than the one he had deposed. Betrayed Mexicans were horrified, and two Mexican states—Zacatecas and Coahuila y Texas—rose in armed revolt. Assembling his large army, Santa Anna crushed the revolt in Zacatecas with notable cruelty, then turned north toward Coahuila y Texas.

With Mrs. Dickinson's terrible story ringing in their ears, Houston's Texans hurried eastward, fleeing from an enemy they thought they could whip easily, torn by a growing mistrust of their commander. Maybe he had a plan, maybe all this would make sense, but he'd better reveal it pronto. A three-day march brought them to the Colorado River at flood stage. Refugees crowded its banks, waiting to ferry across on rafts. By now panic had spread. There were even some deserters from Houston's little army. As Houston's men marched east, the people bitterly condemned the army and its general. The troops were supposed to stop the Mexicans, weren't they? And now, with the story of the Alamo burning the air, everyone was on the run. It seemed shameful. They got to calling it the "Runaway Scrape."

*An unregenerate Texan, David Nevin is author of a book about explorer John C. Frémont. He last wrote on the Peggy Eaton affair (*SMITHSONIAN*, May 1992).*

On the way to San Jacinto, Houston's army camped for a few weeks on the west side of the Brazos River.

Battlefield map shows how the two armies were locked in by terrain. For both, it was kill or be killed.

After a 30-mile trek south along the east side of the Colorado, Houston's Texans set up camp. The lead Mexican elements camped opposite. Now it was fight for sure. But Houston saw things more broadly: scouts told him Santa Anna was advancing with what he recognized as professional skill. The Mexicans had formed three columns, 1,200 to 1,500 men in each, advancing separately into Texas.

There was the tactical dilemma. Attack one of the three columns and the next would move over to counterattack. Houston's boys were confident that, turned loose, their fury would carry any battle. Probably, given reasonable odds. But then what? The real danger would follow, for with fury expended, they might be so drained that a mere 100 bayonets in disciplined counterattack would drive them like cattle.

They were, in short, a glass dagger, deadly on first thrust but very liable to shatter. That point, inexplicable to them, apparently underlay their commander's calculations. He would fight only when there was a chance the fight could be decisive. He awaited opportunity, but to the men he offered not a word of explanation, then or later. Explanations weren't his way.

Sam Houston wasn't without tactical opportunities. With his own force and the 400 under Col. James Fannin, the officer he had ordered to retreat from Goliad, he might be able to drive a wedge between the Mexican columns. But then, fresh news ripped through the camp. Fannin had not withdrawn as ordered but had been trapped and his men taken prisoner. Houston's little army was all that remained to save Texas.

The boys raged anew. Knives snicked against stone,

He trained the men, while rumors of his cowardice grew. When two cannon arrived, the army moved out.

Before battle, Santa Anna's men worked through the night stacking a barricade of carts and ammo boxes.

and all over camp there was a great cleaning of rifles. Mexicans were right across the river. Let's go get 'em! Quietly their commander passed stunning new orders: build up the campfires at dusk to fool the enemy—and retreat.

Running again. They couldn't believe it. Was he a traitor? Was he a coward afraid to hear the lead sing? At the flooding Brazos River, Houston swung north toward deep swamp country. They marched in bitter fury, thundering rain matching their mood. Two companies refused to go farther. This was mutiny, but Houston defused it. He stationed the units on the river, with orders to defend two crucial crossings but not to sacrifice themselves.

After three awful days of ever deepening mud he stopped on land that was soon nearly surrounded by the rising river. Here he could get the boys in order and train them. They wanted to fight, not train, but he knew that soldiers acting as a unit magnify individual weight. The trouble was, they weren't soldiers and were proud of it.

After seeing their families to safety, more and more men had been coming in. Houston's numbers had grown now to nearly 900—perhaps enough, provided Santa Anna made a mistake.

Then more terrible news swept the camp. Those men captured at Goliad? Mexican troops had marched them in groups out three different roads and shot them down. New fear overtook fleeing civilians; new rage shook the men who felt they were skulking in swamps. Civilians and troops alike were sure their general planned to run to the safety of Louisiana. About then a self-appointed new leader rode into camp, a charismatic fellow with a flashy name—Mirabeau Buonaparte Lamar. He had a plan. Why not set up a fresh army under his command and beat the drum for volunteers from Houston's army for a special mission? The effect would be to undermine the general's authority.

Everyone talked of it, eyeing their general. Houston said nothing. Presently, soldiers were seen digging holes. Two holes. Houston stood nearby, watching the men dig. Uneasy questions: What in the world were they? Graves, they're graves. Orders now were nailed to trees, saying that any who beat for volunteers from this army would occupy those graves. None doubted Houston would do as he said. Deflated, Lamar volunteered to ride as a private in the cavalry.

Santa Anna, weary of the campaign, heard the gossip about Houston and believed it. When he met peppering fire from the company holding the Brazos crossing, he didn't press. His efficient and deadly three-pronged advance was cumbersome, so he ordered his columns to come together and turned south, away from the swamps and the Texas army. Houston read this move clearly. Santa Anna was relaxing; perhaps an opportunity would follow.

Then everything changed. A youth rode into Houston's camp with some remarkable news. His name was Joseph Powell and his mother, one of the few who hadn't fled, ran a tavern. Santa Anna had stopped and ordered dinner. The boy understood Spanish and overheard Santa Anna discussing plans. It appeared that the Mexican leader now underrated the Texas army, seeing Houston as a coward and a weakling, his

In the battle's ghastly and surprising climax, Texans drove enemy into the bloodied waters of nearby swamp.

men a rabble huddling in the swamps. Santa Anna had also heard that the Texas government—the president and six-man cabinet that included one Mexican, the vice president—had retreated to Harrisburg, only 40 miles away. Why not dash ahead, execute these officials, pinch off the revolution's head and be done with this boring campaign? In fact, a light force, 750 men and one cannon, was being detached to race forward—with Santa Anna himself in command.

There was the mistake the Texans had to have—the other columns hadn't arrived and now Santa Anna had temporarily lost his numerical superiority. Houston unrolled his maps. The Mexicans were heading for Harrisburg, a town on Buffalo Bayou. The bayou flowed 13 miles eastward to empty into the San Jacinto River, which ran ten miles south to Galveston Bay. At the point of land defined by the juncture was Lynch's Ferry, a main route east to the Louisiana border. With water on two sides and a small raft-ferry the only outlet, the place had the look of a trap. But for whom?

The Texans moved out on a forced march that would cover 55 miles in just over two days. They found Harrisburg in ashes. Santa Anna had burned it and turned south in pursuit of the fleeing Texas government. But he had heard that Houston hoped to escape through Lynch's Ferry, and Santa Anna intended to trap him there. Some 500 more Mexican troops were ordered forward for the purpose. Sure that the Texans would spend days on the road, Santa Anna was in no hurry. The speed of Houston's forced march had already fooled him.

Houston's men crossed Buffalo Bayou and marched eastward in the dark, following its southern bank. Before dawn they camped for only an hour, then quickly moved on until they reached a grove that lay along the bayou. They were on ground from which retreat would be difficult.

In the early afternoon, the Mexicans arrived, a long, snaking column of blue with a brass cannon. Cavalry rode ahead, pennants fluttering from lances. The Texans leaned on their pieces and watched. Santa Anna was surprised to find Texans waiting for him, but not alarmed. After all, he had them outnumbered and crowded into a watery corner.

What would be the battlefield was well defined (see map, page 86). Houston was in a live oak grove, Buffalo Bayou behind, the San Jacinto River to his left. A mile of grass high as a man's knee waved before him. Opposite, outside another grove, lay the Mexican line. Water was behind it, too, an arm of the San Jacinto.

The Texas cavalry forced a skirmish that evening and General Houston was furious. Eyebrows were raised. Would he never fight? They went uneasily to sleep expecting to be awakened for an attack at dawn. Instead, they woke up to find their general sleeping in. At midmorning Santa Anna's reinforcements arrived.

The fighting took just 18 minutes. When it was over, 650 Mexicans were dead, 34 Texans dead or wounded.

This may have been what Houston was waiting for, though he didn't say. Santa Anna now had about 1,250 men, while dysentery and other ills had reduced the Texans' numbers considerably.

Houston's scouts told him the new arrivals had marched all night. Those already on hand had been up, too, working through the darkness to put up barricades of carts, pack saddles and stacked supplies. At dawn on the 21st of April 1836, the Mexicans had stood ready to meet an attack. But they were tired. When the Texan attack didn't come, torpor settled over the Mexican camp.

Houston's officers were grumbling again. He posed a question: Attack or await attack? For all their grousing, they couldn't decide. Houston dismissed them. He was facing trained soldiers accustomed to making bayonet charges terrifying to men who lacked bayonets. The Mexicans were armed with muskets that could be loaded faster than rifles and were fairly accurate at close range. If he attacked, it had to be across that empty field, but if he waited too long he would face sophisticated tactics likely to confuse, demoralize and finally break his army.

Lookouts reported all was quiet—if the Mexicans had sentries they must have been invisible. General Houston walked among the troops. Unwashed, unshaved, with their clothes torn and filthy, their hair matted, his men looked like devils. Did they want to fight? A roar. "All right," he said. "Fight and be damned!"

Sometime after 3 P.M. he formed a battle line, cavalry on the right, two companies of infantry in the center, 1st and 2d Regiments on the left, with the 2d positioned to pass through timber and remain partly hidden until it emerged to strike the Mexican right. They had two little cannon, the "Twin Sisters," donated by the kind citizens of Cincinnati. A slight rise in the middle of the field partly hid the two camps from each other, but lookouts in the trees reported the enemy wasn't stirring. "Trail arms! Forward!"

It was 4:30 P.M. Darkness would come in a couple of hours, and in the dark, undisciplined men would be at great disadvantage against those trained to fight in units. It was the custom, moreover, to attack at dawn, to have a whole day in which to fight. The enemy apparently expected nothing; perhaps he could be surprised. Houston's tactic was wildly unorthodox, the best chance to win but also the best chance to lose. It was a decision that would carry the mark of genius if it succeeded, the stigma of criminality if it failed.

The Texans advanced in two lines some 900 yards long, the men 2 or 3 yards apart, walking steadily up the rise through knee-high grass. There was constant rustling, as field mice dashed ahead of them. Insects buzzed and chattered. The men pulling the cannon forward on draglines grunted as the wheels cut into rain-softened ground. As they crested the rise, they saw

Santa Anna was captured in a private's uniform, but his men gave him away by whispering "*El Presidente!*"

the whole Mexican line before them, the barricade dark and formidable. But they saw no sentries and no sign of alarm. They broke into an urgent trot, breathing hard. A few scattered yells sounded up ahead. The Mexicans expected to attack, not be attacked. They had worked or marched all night; now they were resting. Santa Anna, too, was having a siesta.

At 200 yards from the barricade, no shot had been fired, the whisper of the men's legs against the tall grass and the murmur of rushing rodents still the loudest sounds, when Houston swung his hat in signal. The Twin Sisters fired, their bellow shocking in the quiet. The Texans dashed forward, screaming their battle cry, "Remember the Alamo! Remember Goliad!"

Their only drum rolled. Three fifers broke into a romantic, slightly salacious ballad called "Will You Come to the Bower?" In the distance a bugle sounded. Figures ran frantically in the Mexican camp. A few appeared on the barricade. Muskets flashed, the sound lost.

Houston stood in his stirrups. "Halt, fire, then charge!" But the men were firing as they chose—drop to a knee, aim, fire, ram, load, and up to run again. Houston's white horse took a ball and fell. He stepped off. Someone caught a riderless horse, and Houston swung into the saddle. The Mexican cannon was firing, but it hadn't been depressed and it overshot.

About then the 2d Texas Regiment burst from the trees on the Mexican right, well behind the barricade line. Pandemonium followed. Hit from two directions, Mexican soldiers had no time to form the units that were their strength. Houston's second horse went down. This time a musket ball smashed into his right leg just above the ankle. A soldier helped him onto another horse. The boys poured through the Mexican camp. The firing was a roar. The Mexican soldiery panicked, broke, whirled and ran. The Texans ran after them, screaming, swinging rifles as clubs, drawing their fighting knives.

The fleeing Mexicans tumbled down the slopes behind their camp and were pushed into the water by those behind them. The Texans were on them, knifing those on the banks and shooting those in the water. They killed everyone who moved, finishing them off with their own bayonets. Mexican soldiers knelt, screaming, "Me no Alamo!" When Texan officers tried to stop the slaughter, the men turned rifles on them. One cried, "If Jesus Christ were to come down from heaven and order me to quit shooting Santanistas, I wouldn't do it, sir!"

When the murderous 18-minute orgy ended, half of Santa Anna's force lay dead, some 650 men. Texan losses were 2 killed, 32 wounded, of whom 7 would die.

As mounted Texans rounded up prisoners, Houston, reeling from pain, blood dripping from his stirrup, saw a new danger. Where was Santa Anna? Not among the prisoners, nor dead on the ground. Somebody said he had fled on a black stallion.

Some 2,500 fresh Mexican troops were waiting within 50 miles. If Santa Anna reached them, he could still win. The Texans could never surprise him again, not with their commander badly hurt. When they cut away Houston's boot they saw a critically serious wound.

Santa Anna: "Be generous to the vanquished"

Needing to stay alert, the general refused morphine. He knew Santa Anna would be moving cross-country and would be dressed as a common soldier. He issued terse instructions, then sat back with his throbbing leg.

In the darkness, Houston's scouts found tracks leading into a thicket. They surrounded it and waited. But when light came, it was vacant. It looked as if Santa Anna had escaped, and the Texas victory was empty. But mounted scouts continued to bring in prisoners. When one of them, a quiet fellow in a private's uniform, was put with others, a whispering began: "*El Presidente!*" Houston emerged from a haze of pain to find the Mexican dictator before him. Santa Anna bore himself proudly and congratulated the victor, adding, "And now it remains for him to be generous to the vanquished."

Houston's growl, "You should have remembered that at the Alamo," was backed by a roar from angry

troops crowding close in bloodstained shirts, proposing to hang the Mexican immediately. Santa Anna asked for some opium. Houston moved him steadily toward the offer the Texan wanted. Soon the Mexican general suggested that he would order his troops home.

And so it ended.

Today the battlefield is surrounded by oil refineries and plants producing chemicals and plastics. Ocean-going tankers ply Buffalo Bayou, now the Houston Ship Channel (SMITHSONIAN, October 1985). The industrial plants are like vast cities of rigidly geometric silver piping. At night, brilliant lights make them look like glowing lace.

Startling consequences flowed from the battle. Texas was free. But nearly ten years would pass before the United States could bring itself to admit Texas as a state, so fierce was national resistance to adding another slave state to the Union. Mexico, meanwhile, never accepted the idea that Texas was more than a Mexican province temporarily gone astray. It promised to fight if Texas were admitted, and when that happened, in 1845, the Mexican War followed.

It was not one of our brightest moments. In the settlement that followed, Mexico was forced to abandon claims to Texas and to sell California and the land between to the United States. A bitterness arose in Mexico that has not abated. And Mexican-Americans, who were often treated as conquered peoples, continue to have mixed feelings about the way in which they became citizens of the United States.

Thus the American West as we know it (with minor border changes) came to be set. And the northern tier of the empire that Spain founded on Columbus' landfall began evolving into the American Sunbelt. Florida was acquired first, of course, but most of the rest hinged on this battle.

So the fourth-largest city in the nation is well named. Without Sam Houston there almost certainly would have been no battle and no victory. If Texas had remained part of Mexico, how different things might be today. Would Mexican pride ever have allowed Texas to shift peacefully to the United States? Would antislavery sentiment in the United States ever have accepted a war to seize a slave territory?

This is our story, Ashlea Brenek had said, and she was right.

Confronting menacing guards and wounded Houston, Santa Anna asked for clemency. Replied Houston, "You should have remembered that at the Alamo." Later, Santa Anna agreed to end the Texas campaign.

By Noel Vietmeyer

A cuddly critter is eating New Zealand's lunch

Imported from Australia to form the basis of a fur trade, the brushtail possum has created a nightmare of unbalanced nature

New Zealand is being eaten alive. The island nation is losing an ecological war to a large-eyed, big-eared interloper, the brushtail possum. Magnificent flowering trees that grow nowhere else are dying, birds are disappearing, even the endemic lizards and snails have their backs to the wall. Agricultural exports, the backbone of the economy, are endangered.

Seventy million possums are devouring an estimated 20,000 tons of plant matter every day, defoliating and killing the trees they feed on. The adults have no natural predators in New Zealand and are producing 20 million young a year, of which 5 million may live to maturity. The bottom has dropped out of the market for possum fur, so commercial trapping is no longer a brake on their numbers. In 1967 the possums were found to carry bovine tuberculosis. Cattle can pick up the highly contagious and almost untreatable disease just by sniffing dead possums or even eating grass over which possums with open sores have passed. The disease is now endemic in large areas of the country.

Normally calm New Zealanders are in an uproar. The well-meaning people who brought the animal to New Zealand to establish a fur trade just a century and a half ago could not have dreamed how much trouble its introduction would cause. To understand the problem requires a little geophysical history.

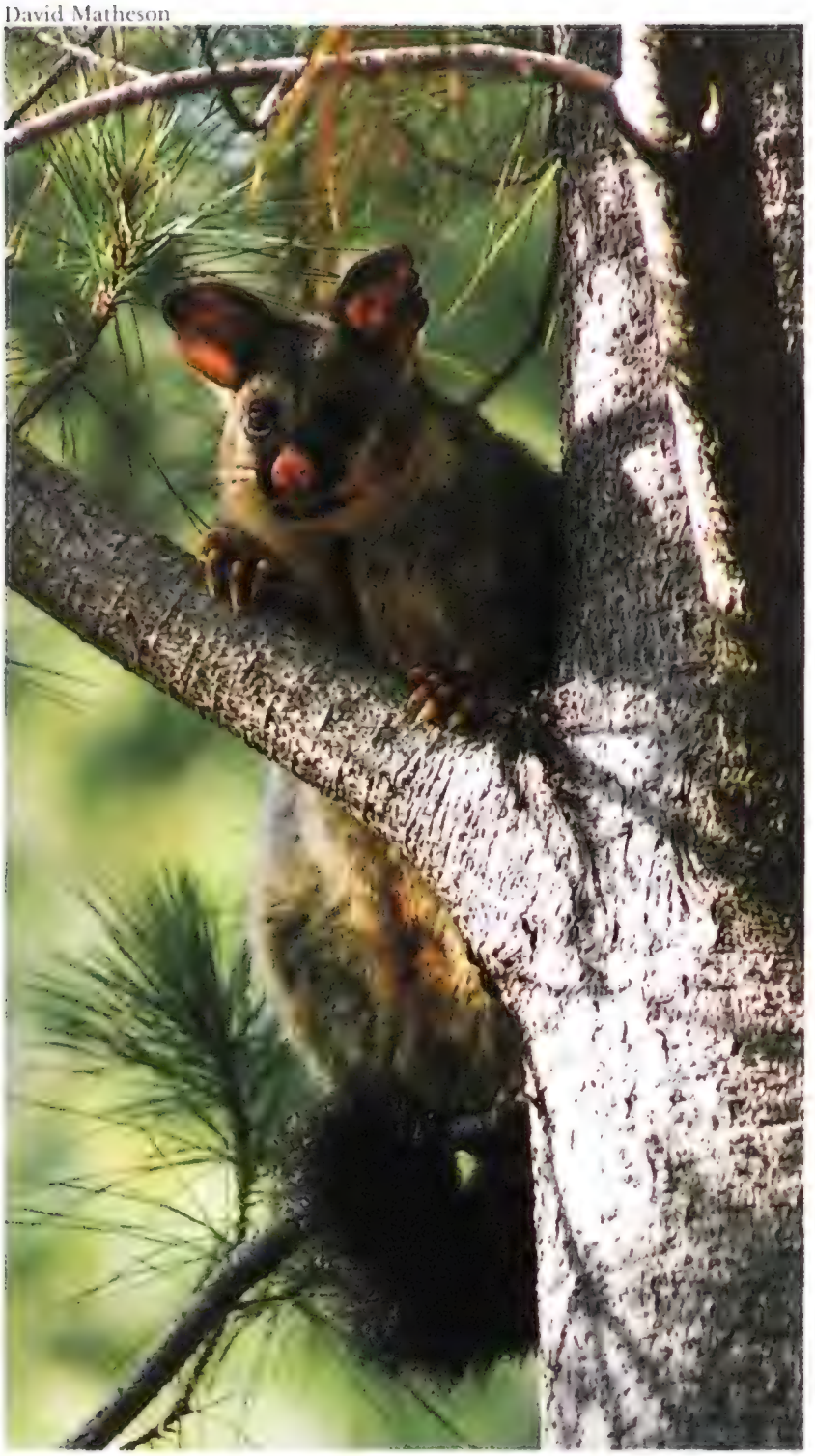
Australia and New Zealand have always been special places for biologists because their floras and faunas are so different from the rest of the world's. In the case of New Zealand, the reasons go back to somewhere be-

Caught in eerie light of night-vision equipment, this possum is one of 70 million defoliating forests.

The animals can see in the dark, but also depend on their numerous scent glands for much communication.

Photographs by Arno Gasteiger

David Matheson



Rusty streak down the front is a stain from a sternal gland, which the animal uses to mark its territory.

tween 90 million and 65 million years ago, when the islands split off from Gondwanaland, the southern megacontinent created when Pangaea broke up still earlier. When New Zealand broke away, it was isolated by vast expanses of stormy ocean, as it remains. This happened so early, evolutionarily speaking, that the islands were left in a premammalian time warp. The first humans to reach New Zealand found no terrestrial mammals whatever: no deer, antelope or bears, not even kangaroos. Bats and marine mammals had arrived by air and sea, respectively. The other vertebrates were likely some lizards of extremely ancient lineage.

While large mammalian herbivores were evolving on other continents, 12 species of moa—a large flightless bird—took their place in New Zealand. Large flightless insects and smaller flightless birds occupied the niches held by small herbivorous mammals in other parts of the world.

The Polynesians brought their dogs with them, and also the kiore, a rat they prized for food and may have brought deliberately. Their arrival meant the extinction of the moas and at least 18 species of waterfowl, rail and game bird. The kiore probably had equally devastating effects on small birds, lizards and insects.

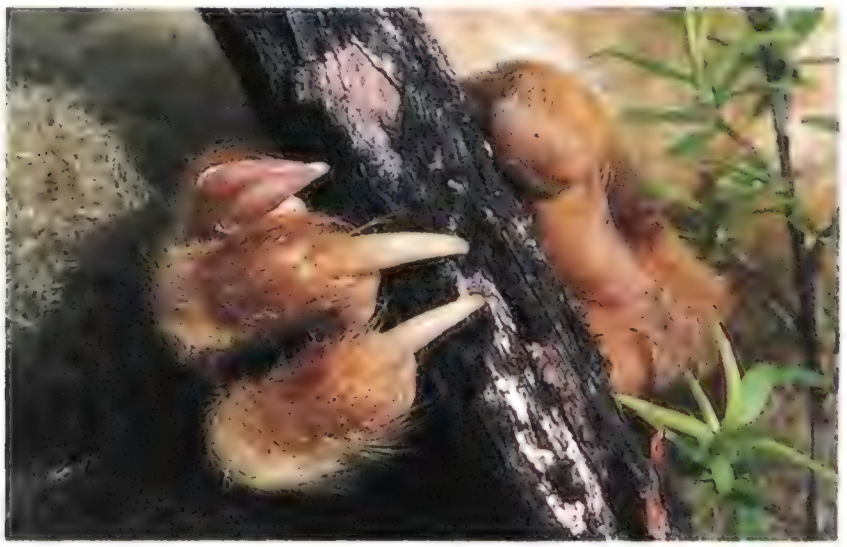
Importing live reminders of home

In the eyes of the European settlers who began arriving in large numbers in the 1840s, New Zealand seemed in urgent need of biological upgrading. They were not convicts, like those who involuntarily settled Australia, but self-confident, middle-class Victorians. They wanted game animals stalking the forests, rabbits on the plains, sport fish in the rivers, waterfowl on the lakes and familiar songbirds in the skies. "Acclimatization societies" were formed to import species from overseas and establish them in New Zealand. They brought in ten species of deer, as well as moose and North American elk, and nine species of kangaroo and wallaby. They imported hedgehogs, weasels, stoats and rabbits (which nearly did to New Zealand what their European cousins did to Australia, until an introduced virus brought their numbers under control). Individuals, including an early governor, also imported favorite animals. The societies released both game birds and avian reminders of home: grouse, geese, swans, two species of sparrow, starlings, blackbirds and thrushes. Streams were stocked with trout and salmon.

And then came the possums. In 1837 a Captain Howell released some near the southern tip of South Island. He believed they could become the basis for a fur industry. They did not survive, but another group released by Christopher Basstian in nearby South Riverton in 1858 did, and the rest is history. The acclimatization societies imported more, particularly

Kennedy Warne

Honeybee-size at birth, joey grows in its mother's pouch during first four months of life, then emerges.



Brushtail possum's opposable "toe" on both hind feet helps it grasp branches while traveling through trees.

Hitchhiking joey may not get off its mother's back for good until youngster is about 8 months old.

between 1890 and 1900. They spread quickly because "liberations" were made throughout the country.

Conflicts between acclimatization societies and farmers, who were suffering damage to fruit, vegetables, grain and grass, arose as early as 1911. By 1922 it became clear that the possums were damaging native forests as well; in fact, the government had refused permission for any more liberations after 1920. Trappers continued to do so illegally, however, moving live animals into new areas in order to extend their range, and were still doing so in the 1980s. After World War II public opinion turned against the possums: the government ended all restrictions on their taking, the penalties for liberating were increased and poisoning was legalized. It was too late.

The brushtail possum (*Trichosurus vulpecula*) is native to Australia. It is only distantly related to the American possum, although both are nocturnal marsupials, and does not "play possum" when threatened. Two principal color forms—gray and black—are recognized, but in reality there is a continuum. Both forms have a rusty streak on the underside resulting from secretions of a sternal scent gland. The sexes are much the same size and weight, but size tends to increase from an average of five pounds for the grays in the north to seven pounds for the blacks in the south. Typically, the animals measure two and a half feet from nose to tail tip but sometimes reach three feet. They have been known to live for 12 years, but in many areas half the population is less than 3 years old.

Females generally live longer than (and win fights with) males. Births are almost always single. After 18 days of gestation the joey is born and immediately crawls into its mother's pouch and attaches to one of her teats. About four months after birth the young possum will come out of the pouch to ride on its mother's back. After six months most joeys will have abandoned the pouch. Young females tend to stay in

A New Zealand native, Noel Vietmeyer is a researcher with the National Academy of Sciences who studies little-known exotic resources. He has written 40 books.

Skeletons of trees killed by possums form leafless swaths on green slopes of South Island's west coast.

In some areas the marauders prefer New Zealand's most beloved flowering trees, adding insult to injury.

their mother's territory, but young males disperse as far as ten miles from their birth site.

The animal is a local problem only to farms and nurseries in Australia: its numbers there are kept down by carpet pythons, monitor lizards, owls, wedge-tailed eagles, foxes and the wild dogs known as dingoes, and feral dogs and cats. It must compete with a dozen other arboreal leaf-eating marsupials, and some trees have evolved chemical defenses against it. In New Zealand the adult possum has no natural predators although, like its North American namesake, it is a frequent victim of cars. Also, feral cats prey on young possums. Trapping has had an impact. For more than a century New Zealand has exported possum fur, in recent decades at the rate of a million pelts a year.

The furs are not nearly as soft, shiny or luxuriant as mink. The best pelts end up in fashionable fur coats in Europe and New Zealand, others form the inner linings of midpriced coats or jackets and children's clothes, and the ruffs around the collars of winter sportswear. Thousands of American closets have this possum's fur somewhere on their hangers. Various industries also use the skins for polishing and for packing sensitive machinery, such as jet-engine parts.

Rough, tough and mostly loners, the possum trappers were 20th-century throwbacks to those fierce independents who had opened up North America's hinterland centuries earlier. Typically, they lived for months on end in shacks, with only a dog for company. Their daily routine was harsh but simple: set out the baits and traps in the evening, gather the catch in the morning, prepare the hides and tack them down to dry during the day, then repeat the process.

Trappers: helping the forests survive

The business was unorganized, but it was not small. By one estimate, more than 100,000 trappers—most part-time—were at work in the 1980s. Some did very well. "Possum Bill" McCabe of Morrinsville, for example, estimates he alone has caught 100,000. His best night's take was more than 700.

Dave Odey is a possum trapper who works each year in the dense brush of the King Country (so called because in the 1860s the Maori king retreated to its impenetrable security to escape the redcoats). Now a gaunt 70-year-old, Odey remembers: "When we first went there 35 years ago, we took out 17,500 possums in the first three months. The next season we got 25,000."

The trappers were helping the forests survive. "When I started working those pieces of bush," Possum Bill says, referring to a stand of native trees near his home, "there was no bird life at all. The possums had eaten all the flowers and berries before they were ripe enough for the birds. But since we cleared out the possums all that has changed. Now the tuis and bellbirds and kakas and [native] pigeons are coming back."

Bright-eyed brushtail feasts on pohutukawa blossoms, hastening demise of the nation's "Christmas tree."

But the bottom fell out of the fur market at the end of the 1980s. The average price of a possum pelt dropped from $8 in 1987 to only $2 in 1990. At times, the markets dried up altogether. At one point, for example, a leading New Zealand exporter, Fred Barnes, had about 80,000 pelts on hand and couldn't sell any.

Trappers tend to blame animal-rights activists around the world who are working to end the wearing of animal furs. They would like to see the activists make an exception for a "green," or ecologically virtuous, fur trade. The argument is somewhat analogous to that made by southern African countries for an exemption to the ivory-trade ban for elephants that must be culled so they do not destroy their habitat.

The trappers are not alone in blaming the activists. Kevin Smith, director of the Royal Forest and Bird Society, New Zealand's leading conservation organization and one that normally would be allied to animal-welfare groups, states categorically: "Animal-rights activists caused the catastrophic decline in the price of possum skins." Graham Adams, pest control director at the Department of Conservation, is equally emphatic: "Major contributors to this disaster are the people in Europe and America who are boycotting furs."

Successful anti-fur campaigns presumably are part of the reason the possum market dropped, but only part. In an article earlier this year in the *New Zealand Geographic*, Gordon Tocher, manager of the Kiwi Fur Company in Dunedin, is quoted on the causes: "I think the anti-fur lobby comes well down the list of causes for the industry's decline. Fur prices had been very

"Possum Bill" McCabe estimates he has caught 100,000 brushtails, but low prices are endangering trappers.

high for a few years, and that was unsustainable. Then there was an enormous overproduction of mink, which glutted the market, followed by the 1987 sharemarket [stock market] crash. Add to that four consecutive warm northern hemisphere winters, and presto! No market for our fur."

Trappers say they need at least $5 a pelt to make it worthwhile, and the price is stuck at $2. At first glance it still seems a trapper could make do. On a 700-possum night, even at $2 a pelt, the take would be $1,400. But with a new government tax of 24 percent per pelt, plus the market loss, few trappers want to go to the expense of a trip to the bush. Where five years earlier there had been 20 to 30 trappers working in his part of the King Country, Odey says, there is now only himself. And even he is not sure how long he will stay. "I just go back because I know no more satisfying life."

In the far north, where Fred Barnes is located, the situation is no better: "A year ago I was buying pelts from more than a hundred full-time trappers, but now barely a dozen people are getting the animals for a living." In the far south the story is the same. The Kiwi Fur Company estimates that the number of active trappers has dropped 70 percent.

It is not clear that the trappers would have been able to keep the hungry possums in check, but without them the situation is getting more serious by the minute. John Halkett, who heads up the Department of Conservation office for Northland, says ominously: "The clock is at five minutes to midnight." The problem in his area is not just the numbers of animals; it is their effect on the special trees that occur in that region of unmatched beauty and extreme fragility. Two of the trees that are dying—the pohutukawa and the rata—are part of the national psyche. Pohutukawa, the country's most beloved flowering tree, is known as the "New Zealand Christmas tree." Every December it livens up coastlines and cities with its blossoms, which look like sparkling red ornaments. Its relative, the rata, also reddens in the summer sun, so much so that it glows like a fiery ball amid the green of the forest.

"They just can't take browsing"

"Pohutukawa and rata are like ice cream to possums," Halkett says, noting that both are botanically related to the eucalyptus, the dominant tree in the possums' homeland across the Tasman Sea. "Most of the big ones lining our northern coastline are 400 to 800 years old, but they just can't take browsing. Ten to 20 percent have died in just the last five years!"

More than natural beauty is at stake. Bovine tuberculosis is considered so detrimental to marketing that animals testing positive are destroyed, and the herds they came from are both tested more frequently and restricted in their movements. Scientists are sure that the disease cannot be transferred to humans who eat meat or drink pasteurized milk from infected animals. But the bulk of New Zealand's meat and dairy products are for export, and restrictions by the importing countries could hurt badly.

Deer and feral pigs carry the disease, and so do possums. Possums come in contact with one another only during mating seasons, when they can infect one another directly, but sometimes different animals use the same den on different nights, and the disease may be passed on that way. Infected mothers can pass TB on to their joeys, which then carry it into new areas when they disperse.

Even when infected, possums normally do not become ill until subjected to some other stress, such as a major food shortage or wet, cold weather. Normally nocturnal, possums may wander about pastures at any hour when they are dying. If a cow comes close, the possum will use its normal threat response: a coughing hiss that will do to the cow exactly what a human

PREVIA

WHY DOES PREVIA HAVE A STANDARD DRIVER-SIDE AIR BAG* AND AVAILABLE ANTI-LOCK BRAKE SYSTEM?

THERE ARE THOUSANDS OF LITTLE REASONS.

Which is why Toyota builds the 1992 Previa to meet all passenger car federal motor vehicle safety standards.** Previa is the only van to meet these standards. Not because it has to but because the obligation to our customers' safety demands it.

"I love what you do for me."

TOYOTA

PREVIA IS THE ONLY VAN TO MEET ALL FEDERAL CAR SAFETY STANDARDS.**

Call 1-800-GO-TOYOTA for a brochure and location of your nearest dealer. *Always use your seatbelt. Driver-side air bag is a supplemental restraint system. **Meets all Passenger Car Federal Motor Vehicle Safety Standards, except models with optional privacy glass due to window tinting. Buckle Up! Do it for those who love you. © 1992 Toyota Motor Sales, U.S.A., Inc.

Bucking popular sentiment, Hazel Petch cares for orphan possums until they can survive in the wild.

tubercular cough will do to an emergency room doctor.

Thus it is that farmers and conservationists find themselves in common cause. Nature lovers who normally would oppose even the thought of disturbing the natural environment are calling for action, any action. The Royal Forest and Bird Society's Kevin Smith says, "We must have a massive campaign against possums."

Don McKenzie, a Department of Conservation spokesman, says conservation officers are using guns and spotlights to shoot possums by night, and training "possum dogs" to find them sleeping in burrows or hollow logs on the ground by day.

The department is also experimenting with poison. In one trial, its helicopters showered 100 tons of poison pellets on part of Northland's revered Waipoua forest. Two months later, it appeared that 188,000 of the estimated 250,000 possums in the 40,000-acre area had been killed. But Maori leaders saw the poison-drop as desecration of their sacred land; they went to court and even threatened to shoot down the helicopters.

Australians are looking on with both bemusement and concern. After a century-long battle with the European rabbit, they know better than anyone what havoc an introduced mammal can wreak on the landscape down under. But now they are at the other end: the culprit is one of their own, a cuddly-looking animal that to them is both benign and fully protected by law. To an Australian, what New Zealanders are doing seems almost as bad as would the mass-poisoning of koalas.

"We are getting some pressure from Australians concerned about us poisoning their beloved possum," says a somewhat exasperated Halkett. "We'd be happy for every Australian to come across and take every last possum home!"

The great dilemma for animal lovers

While the majority of New Zealanders are trying to get rid of possums, some are befriending them. The Royal Society for the Prevention of Cruelty to Animals regularly nurses sick possums back to health. Ross McLauchlan, director of the Wellington branch, takes in one or two ill or injured possums every day. This practice annoys the government, which is spending millions to eradicate them.

Homeowners are caught up in the same kinds of conflicts. Even the most kindhearted animal lovers are pushed too far when marauding critters chomp down their shrubbery and strip bare their vegetable gardens and fruit trees. Recently an Auckland couple, angry at the destruction of their prize rose bushes, captured the perpetrators in humane traps. But their problems had only begun. What to do with the still-very-much-alive possums? They tried the city, the animal welfare organizations, the government; no one would take live possums. So, in frustration, the couple released them in the area of the city's wealthiest homes. "Maybe that will get some action," they (anonymously) told a reporter.

The attic of a man in Napier was invaded by possums; the noise of their chewing (on the electric wiring, among other things) was keeping him awake. He trapped 27 but could not bring himself to kill them. He drove them out to the countryside, but just as he was about to release them, a farmer showed up. The memory of the resulting confrontation is what now keeps him awake at night.

Greenpeace New Zealand is caught in the middle. Although the organization opposes trade in furs, it agrees that the possums have to be controlled somehow. "We're going to have to make some pretty hard-headed decisions and get our priorities right," a spokesperson said.

A group called Save Animals from Experimentation is not ambivalent. "The only eradication we would approve of is some form of chemical sterilization," said Adrienne Hall. "Our concern is the suffering of animals, and there is no trapping or poisoning method

currently approved [by us]." She predicts that anti-fur lobbyists will never agree to any renewed fur trade.

At the moment, no one knows how to sterilize 70 million animals that move through the treetops at night. But government agencies and universities are working hard on a way to infect possums with a contraceptive agent, possibly by genetically modifying a virus. Until some such solution to the overpopulation problem is found, the government will continue conventional methods: poisoning, trapping, and shooting on sight. The Department of Conservation will spend about $3 million this year, while the Ministry of Agriculture and Fisheries and the Animal Control Board will spend another $4.5 million on possums as part of managing the bovine tuberculosis problem.

There are some success stories. The animals have been eradicated from several islands and nearly so from the Coromandel Peninsula. Bovine tuberculosis appears to have stopped spreading: the number of infected herds dropped this year. And there have been some imaginative efforts to open up whole new markets for the overachieving marsupial. Even if the fur trade never revives, some hope it may be possible to create a demand for possum meat. (An overseas market for New Zealand deer meat turned that pest into a resource.) Carmen Fernandez-McEwan of the food technology department at Massey University points out that the meat is low-fat, moister than rabbit and does not suffer from a gamey flavor. She and her colleagues are experimenting with possum lasagna, chili and sausage, among other dishes. At least one entrepreneur has sent shipments of possum meat to several Asian countries, but so far the response, unlike that to New Zealand venison, has been lukewarm.

The battle can never be entirely won; authorities agree the brushtail possum is in New Zealand to stay. But they hope that one way or another, its population can be kept at a level that will allow both animal husbandry to thrive and the native natural wonders of the nation's unique biota to survive.

Trappers and game wardens aren't the only humans who have a negative effect on the critter's population.

In New Zealand, not everyone brakes for brushtails; roaming possums often face death on the highway.

By Jon Krakauer

Ice, mosquitoes and muskeg—building the road to Alaska

Drivers used to complain that the Alaska Highway was tough on cars. They had no idea how tough it was on the men who made it

Driving hard through the craggy highlands near Summit Lake in British Columbia, I was forced to brake abruptly as I rounded a bend and came up fast behind a rust-pocked Dodge van with Florida plates. The dilapidated vehicle was badly overloaded and belching blue smoke as it climbed the steep, rutted curves that led toward the crest of the Rocky Mountains, the highest point on the entire Alaska Highway. Unable to pass safely, I had just settled in behind the junker when it hit a pothole. One of the rear doors flew open and an avalanche of duffles and bulging cardboard boxes tumbled onto the road directly in front of me.

I skidded to a stop. The van skidded to a stop slightly beyond, and its driver and I converged over the cargo strewn across the highway. "Shoot," the fellow observed in a syrupy Southern drawl, "the folks who built this damn road didn't make it none too easy to get to Alaska, did they?" A tall, skinny man in his late 20s, he was wearing a Bart Simpson T-shirt, and his greasy brown hair was tied back in a ponytail. Grinning broadly, he stuck out his hand, said his name was Boone and volunteered that he was headed to the 49th state "to start fresh. You know, wipe the slate clean, carve out a whole 'nother life for myself, get away from the rat race."

Completed 50 years ago, highway approaches St. Elias Mountains south of Haines Junction in the Yukon.

Soldier with the Army's 341st Engineers rested on the hood of a truck making an unscheduled stop during construction of the roadbed. Crews discovered they could control melting muskeg by laying logs across it.

Boone's optimism and good cheer soon had me smiling, as well. As I helped him collect his belongings, I was reminded of the sense of adventure that had permeated my own first trip up the Alaska Highway. On a hot May night in 1975, the same day classes had ended, three college friends and I climbed into a battered half-ton pickup and sped out of New England, hell-bent for the Klondike and points beyond. Other wild corners of the globe held a powerful grip on our imaginations, too, but Alaska had one distinct advantage: there was a road to it. Or at least they called it a road. That most of the 1,442-mile route between Dawson Creek, British Columbia (the official start), and Delta Junction, Alaska (the official end), followed a molar-jarring grade of unpaved dirt was unimportant. All that mattered was the fact that it was there.

This year marks the 50th anniversary of the highway's existence, a milestone that will be observed up and down its length by more than 200 celebrations. Who knows how many thousands of misfits and dreamers it has inspired, for better or worse, to climb into unreliable vehicles and invent new lives for themselves in the Land of the Midnight Sun? Whatever the number, it would be even greater if the highway had been built when it was initially proposed.

Serious talk first surfaced in 1865, when the Western Union Telegraph Company set out to erect a telegraph line from the United States to Siberia via Alaska, along with a trail to service it. Hundreds of miles were actually blazed before the project was abruptly called off in 1869. The next murmurings were heard in 1899: Edward Henry Harriman, the notorious financier and railway baron, considered building a railroad to Nome, Alaska, running the tracks through a tunnel under the Bering Strait, across the whole of Siberia and ultimately all the way to the capitals of Europe. The Russo-Japanese War of 1904, alas, put the kibosh on that.

A highway to the Alaska Territory looked like a sure bet in 1931 when a special Congressional commission gave it an enthusiastic endorsement, but President Franklin Roosevelt's interests lay elsewhere. His inaction dismayed boosters in Alaska who, floundering in the depths of the Great Depression, saw the road as a magnet for growth and prosperity.

Nobody was more zealous than C. C. (Slim) Williams, a rangy, flamboyant prospector and dog musher who had a knack for brash publicity stunts. In 1933, at the age of 51, he drove a team of sled dogs from Alaska to the Chicago World's Fair, proclaiming at the conclusion of the 13-month journey, "If my dogs can pad their way to Chicago, by golly, an automobile can do it!" The trip earned Williams and his malamutes an invitation to the White House, but the President still seemed unconvinced. So the resourceful Alaskan concocted an even more brazen stunt.

In May of 1939, Williams and a 25-year-old companion named John Logan departed Fairbanks for Seattle, a distance of 2,300 miles, on motorcycles. Logan, now 78, recently told me at his home in Connecticut that one of the road's biggest doubters was

Motorcycling to Seattle from Fairbanks, Slim Williams (left), Blizzard and John Logan blew into Vancouver.

Marker in Dawson Creek, British Columbia, designates the official start. The official end is 1,422 miles away.

Louis Johnson, Roosevelt's Assistant Secretary of War. "Johnson told Slim that the country he'd seen from the air was 'so rugged a man couldn't even lead a horse over it.' Slim replied that, to the contrary, the route was gentle enough for a motorcycle to be driven over it, and he made a bet with Johnson to that effect."

Williams (who died in 1974 at the age of 93) ultimately won the wager, but the 201-day trip was no joyride. The first 90 miles were OK, but it took a couple of months just to cover the next 150. For much of the way, the two men had to push their motorcycles. Because the noisy machines scared away game, their owners came close to starving, and Logan once fell unconscious for 12 hours after eating poisonous plants. Impenetrable brush and deadfalls blocked the way. The bike wheels frequently became mired in treacherous muskeg bogs. "You'd almost sink out of sight if you stepped in the wrong place," says Logan.

Dozens of fast streams and rivers had to be forded. Sometimes it was necessary to build elaborate rafts, put the machines on board and resort to desperate paddling. When they had to cross a sizable tributary of the Stikine River about a hundred miles out of Telegraph Creek, the men spent a day and a half making a boat by stretching their canvas ground cloth over a frame built from saplings. "It leaked badly," Logan recalls. "The river was 300 yards wide, and it was impossible to bail fast enough to keep the thing from swamping. We just barely made it."

Six and a half months after they started out, the emaciated bikers rumbled down the streets of Seattle and declared that their journey proved a highway to

Jeep passed trucks abandoned in a frozen river by troops who didn't have time to retrieve them. At right,

Lt. Walter Mason, who led a company of black troops, was photographed with a Cat at Canadian border.

Alaska was feasible. Two years later, when the Japanese bombed Pearl Harbor, the issue was settled once and for all. American military leaders feared that a blockade of Alaskan seaports, followed by an all-out invasion, might be imminent. Roosevelt and his advisors thus decided that the highway, however difficult and expensive to build, should become a top priority. Funding was approved, followed by hasty negotiations with Canadian authorities for rights-of-way; most of the road would be in Canada.

Survey crews, guided by local trappers, started flagging a route through the gnarly taiga of northern British Columbia in March 1942. By June, some 10,000 American troops had begun to advance a ragged track through tight stands of spruce and seemingly bottomless muskeg bogs, but not long after construction commenced, disaster struck. A makeshift pontoon raft carrying a bulldozer, a jeep and 16 soldiers across a lake sank when it was hit by a violent spring squall. A trapper who lived nearby made several trips with a small rowboat to pull the men out of the frigid water but was able to find only 5 of them. That night, as the Army searched for the bodies of the other 11, the aurora borealis shimmered spectacularly across the Canadian sky.

Despite this tragedy—and others that followed—construction continued at a frantic pace. In early June, Japanese planes attacked the U.S. naval base at Dutch Harbor, Alaska; later that month several thousand Japanese soldiers invaded the Aleutian Islands of Kiska and Attu, lending an even greater sense of urgency to the undertaking.

The ballooning work force was a mixture of military personnel and civilian contractors. A famous advertisement cautioned would-be civilian workers that employment would be "NO PICNIC. Men hired for this job will be required to work and live under the most extreme conditions imaginable. Temperatures will range from 90 degrees above zero to 70 degrees below zero. Men will have to fight swamps, rivers, ice and cold. Mosquitoes, flies and gnats will not only be annoying but will cause bodily harm. If you are not prepared to work under these and similar conditions DO NOT APPLY."

For military personnel, who made up nearly half the work force, declining Uncle Sam's offer was not an option. Although they have received short shrift in most history books, three of the seven Army regiments sent north were segregated units made up of African-American troops commanded by white officers. "All soldiers tended to be treated less favorably than the civilian workers, because they didn't have to be persuaded to stay," says Ken Coates, a Canadian scholar who has written a history of the road titled *North to Alaska!*, "but the black soldiers had it worst of all."

Coates explains that the "American government, suffering from the prevailing prejudices of the day, was terribly nervous about the racial tensions that might flare up if large numbers of black troops were stationed in or near the white settlements of the North. So

Jon Krakauer wrote about wigs in the October 1991 issue. The paperback edition of his book Eiger Dreams *is due out from Laurel/Dell next month.*

they generally placed the black regiments way out in the bush, along the most remote, least populated stretches of the road, where there were no facilities, the food was poor, and the men had to go for months with very limited outside contact. Many of the white regiments, on the other hand, worked near established communities that turned into construction boomtowns, and offered a relatively wide range of amenities: the companionship of women, regular mail service, bootleg liquor, movies, even skating rinks."

Many of the black soldiers had never been outside the Deep South before. As construction dragged on into the winter of 1942-43, they were confronted with temperatures that plunged to −70 degrees F. "Lord, it was bitter cold," recalls Clifton Monk, a staff sergeant in the 97th Engineers, a black regiment. Monk, who returned to the warmth of his native North Carolina after the war and has lived there ever since, has painfully vivid memories. "Your breath would turn to ice inside your blankets at night. If you touched anything metal with bare hands, you couldn't tear your skin loose. We'd have to keep fires burning underneath our trucks all night, or they wouldn't move in the morning."

In the summer, clouds of mosquitoes materialized from the soggy ground. "They were big sons of guns," Monk recalls. "They'd swarm just like bees and leave a knot on you when they bit. We had to wear head nets the whole time we were working; we even had to feed ourselves through those damn nets. Every time you'd lift the net to take a bite of food, dozens of mosquitoes would fly in and bite you on the face. You'd swallow four or five of them with each mouthful."

Despite the rough working conditions, says Walter E. Mason, one of the 50 or so white officers assigned to the 97th Engineers, "morale was good. The men I worked with handled the challenges remarkably well. I came away with a lot of respect for them."

Few challenges were greater than the engineering dilemma posed by the endless miles of muskeg—an expanse of spongy, poorly drained, peatlike organic matter overlying a permanently frozen bog. Wherever the highway was built right on top of muskeg, the gravel roadbed would conduct the summer's heat deep below the surface, melting the underlying permafrost and causing the road—and any hapless vehicles that attempted to drive over it—to sink into a sea of muck.

Clifton Monk, Walter Mason and the rest of the 97th Engineers had traveled by sea to Valdez, Alaska, worked inland to Tok, then headed south. "We went up there not having a clue how to build over muskeg," Mason confesses. "Initially we tried scraping the moss down to solid permafrost with our Caterpillars, but within a few days the roadway would melt and turn into soup. Machinery was constantly getting stuck. It took us a week or two before we learned to leave the muskeg undisturbed, and lay down layers of corduroy and gravel to span it." The corduroy was fashioned from thousands upon thousands of logs laid crosswise

The road builder's life wasn't all work and no play, even in the Northern wilds. One soldier enjoyed a bath (left) on a Saturday night; others (above) savored a different kind of liquid refreshment during time off.

atop the muskeg and beneath the roadbed, each of which had to be hand-cut from the surrounding forests.

Today many travelers are puzzled by the fact that the highway follows a meandering, seemingly illogical line for much of its length. "The desk-sitters in Washington originally plotted it as a series of perfectly straight lines between key points," explains Mason, "but we were forced to curve around hillsides wherever possible, to avoid muskeg. The emphasis was on speed, so we followed the path of least resistance. We tried to stay as close as we could to the men out front blazing the trail. Often our Cats were right on top of the people setting the survey stakes. Once we crossed the Tanana River, we were putting in better than five miles of road a day."

On October 25, 1942, Cat skinner Refines Sims jr. of the 97th Engineers was working in thick forest near the Yukon village of Beaver Creek when he encountered an identical Cat that had been driven up from the south by Pvt. Alfred Jalufka of the 18th Engineers, a white regiment. When the two big machines lumbered up to each other and ceremoniously touched blades, the final link was connected. On November 20, just eight months and 12 days after building began, the road was officially opened in a formal ceremony.

The "pioneer road," as that earliest incarnation of the highway was christened, scarcely deserved to be called a road in many places. It took another 11 months of work before it was passable year-round. Even then, and for many years thereafter, bridges would regularly wash out in the spring and summer months. In a single day, July 10, 1943, no fewer than 40 bridges were swept away. But however much it may have been subject to the caprices of nature, the fact that it had been built at all—to say nothing of the incredible speed involved—made the Alaska Highway one of the engineering marvels of the century.

The impact on the culture of the North was swift and profound. Before the highway, Fort St. John was an isolated backwater with 1,500 inhabitants; soon after construction began, it was overrun with thousands of G.I.'s and other workers. "They completely changed the town," says 81-year-old René Dhenin, a trapper and resident since 1929. "The most noticeable thing was the sudden shortage of women. The local girls could pretty much take their pick. Quite a few of 'em dropped their Canadian boyfriends for those American brass buttons. Sure, it caused friction. You bet."

While the local men grumbled, most of the women had no complaints. In 1943, Evelyn P. Wince, currently of Anchorage, was a teenage former fashion model from New York City who had left home to work on the highway as a secretary for the Corps of Engineers. "I never once got homesick for New York," Wince insists in an accent that still betrays her roots. "I was having too much fun. There were ten officers for every girl—who wouldn't have fun? A girl could look like a bulldog and still have a date every night."

Predictably, as the tiny settlements along the high-

Black bears panhandled food from cook assigned to the 341st Engineers. Cooks for a survey party attached

to the 29th Engineers (above) baked bread in a field stove at their camp 70 miles east of Carcross, Canada.

Swiss cyclists Beatrice Staeheli and Monica Morellon pause on highway during Fairbanks-to-San Diego trip.

Waitress fills cup in Toad River Lodge, Milepost 422. Hats decorating the ceiling were donated by tourists.

way turned into boomtowns overnight, they attracted a full complement of hustlers and scam artists. There was a brisk business in bogus coupons for sugar rations, and an even more profitable trade in fake liquor permits. "Liquor was strictly rationed on the highway," explains 80-year-old Alma (Frenchy) Enck of Anchorage, who spent most of the construction years working as a waitress in a Chinese restaurant in Dawson Creek. "You could only get one fifth of liquor a month, or a case of beer. I worked out a deal with a military policeman who would bring in phony permits he'd confiscated from the G.I.'s. He'd tip the liquor store owner to fill several permits at once, and then I'd turn around and sell the booze to truck drivers out of the back of the restaurant. Boy, we made some good money bootleggin'! I paid off my mother's mortgage in no time flat."

The flood of liquor, and all of the other artifacts of modern life that washed in with the highway, had devastating consequences for the indigenous peoples of the North. Mumps, measles, tuberculosis and whooping cough—diseases introduced by the hordes of workers, diseases to which many Alaska Natives had no immunity—decimated Native towns. The lure of highway jobs accelerated the displacement of the traditional subsistence-and-barter lifestyle. Entire villages were uprooted, and hunting grounds were ruined by the influx of hunters and poachers.

Not exactly a yellow brick road

Today the highway conveys 40,000 vehicles in a normal year. Recently I drove it again to take a measure of the changes that have occurred since my first trip. As I pulled away from "Milepost 0" in Dawson Creek, the most obvious difference was the pavement. Before, there had been only a narrow gravel lane. About 90 percent of the highway is paved now, and every year a few more miles of the old dirt road are surfaced, straightened and otherwise defanged.

Between the manicured blacktop and the bucolic farmland stretching off into the summer haze, the start of the highway seemed less like a gateway to the country celebrated by poet Robert Service than like a misplaced corner of Kansas. Just a couple of hours beyond Dawson Creek, though, the carefully tended fields surrendered with shocking suddenness to ragged heaths and obstreperous spruce thickets. As the road climbed past Milepost 135, snowflakes began to swirl furiously.

Many who drive the Alaska Highway are disappointed to find that it isn't lined from start to finish with towering peaks and tumbling glaciers. There are sights along the way that take your breath away, to be sure: the ghostly summits of the St. Elias Mountains soaring 19,000 feet above Kluane Lake, for instance, and the icy, sinister profile of Mount Hayes that fills the skyline

south of Delta Junction. But most of the time the view over the dashboard is of nondescript, turtle-backed hills, marching from horizon to forested horizon.

Despite the immensity of the wilderness, I could see that civilization had made many inroads during the past 17 years. Gas, for one thing, was much easier to find. I also noticed that a traveler now has the opportunity—if that is the correct word—to stop beneath golden arches and dine on Big Macs at several places along the route. I encountered perhaps a dozen bicyclists, including a pair of teenage girls from Switzerland who were cheerfully pedaling from Fairbanks to San Diego—despite the fact, Beatrice Staeheli confessed, that "until this trip neither of us had ridden farther than a few kilometers." Where once I had skinny-dipped in complete privacy in the steaming pools of Liard River Hot Springs, nearly 500 miles out of Dawson Creek, I found a boisterous crowd of bathers and a long list of posted regulations.

The famous Watson Lake Sign Post Forest, which began in 1942 as a single post adorned with directional signs displaying the mileage to nine distant cities, had turned into a veritable signpost jungle. Bordering a five-acre plot, it was festooned with more than 12,000 signs erected by travelers to commemorate their hometowns.

In 1975, Whitehorse, the capital of the Yukon Territory, had been a mean, seedy burg with a tavern on every corner, where my friend Bill Resor and I were nearly punched out after we made the mistake of winning a game of pool from some inebriated locals. This time I found Whitehorse to be a prim, prosperous community of 20,000 souls, most of whom seemed to be either businessmen or bureaucrats. But the rowdy character of the good old days had not been entirely obliterated. Downtown I came across a poster advertising a series of fistfights to determine the "Toughest Man in the Yukon. For street-fighters, brawlers, bouncers, bikers, martial artists, and anyone else who thinks they're tough!!! First Place: $1,000 cash."

"Can I put my hat on your ceiling?"

At Milepost 422, I stopped for dinner at a roadhouse called the Toad River Lodge. Situated in a heartbreakingly beautiful valley and serving as the cultural nexus of greater Toad River (pop. 66), the lodge boasts the "largest hat collection on the Alaska Highway." Every square inch of the ceiling is covered with hats left by tourists—3,300 of them, according to Vivian Clarke, the proprietress.

Clarke was having coffee with a woman from Fort St. John named Karla Marsh, whose father had worked on the highway in 1942 and '43 as a photographer with the 341st Engineers. Clarke, for her part, had spent her

French tourists Roger and Chantal Rousse thumb a ride from Whitehorse to Kluane National Park in Yukon.

Young traveler enjoys a quiet moment at dawn in Liard River Hot Springs, 500 miles from Dawson Creek.

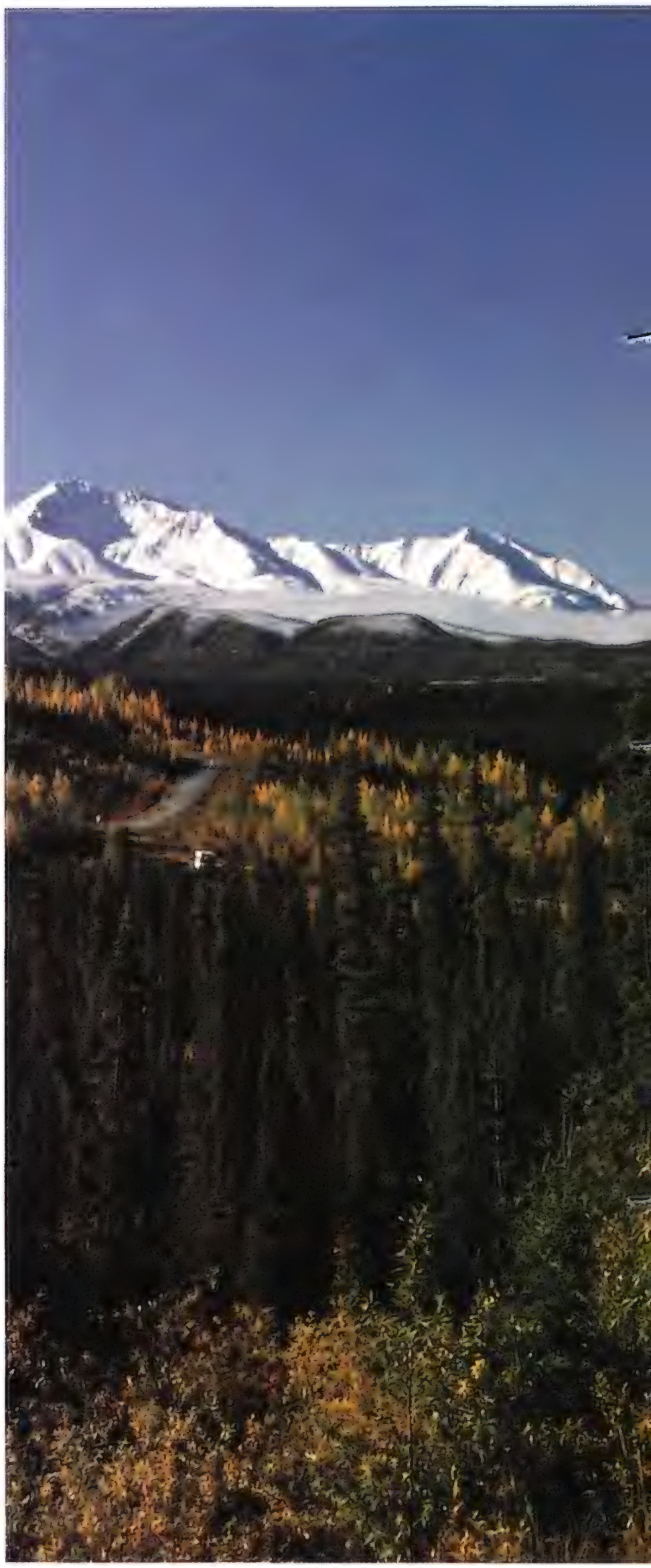
entire life in tiny outposts along the road. "I've rarely traveled south of Fort St. John, or much north of Toad River," she proudly informed me. "Oh, once I drove all the way to Watson Lake on an ambulance run, but it was dark at the time, so I can't really tell you what it was like."

When anyone suffers a serious injury between Toad River and the Yukon-British Columbia border, it is Clarke and her husband, Barry, who pick up the pieces and deliver them by ambulance to a transfer point where the victim is shifted to another ambulance for the hospital in Fort Nelson, 122 miles away. "The average run is about seven hours," Clarke says with a sad shake of her head, "so you sure don't want to hurt yourself too seriously around here. Usually we have only two or three fatalities a year on this stretch of highway—people who run into a moose or fall asleep at the wheel."

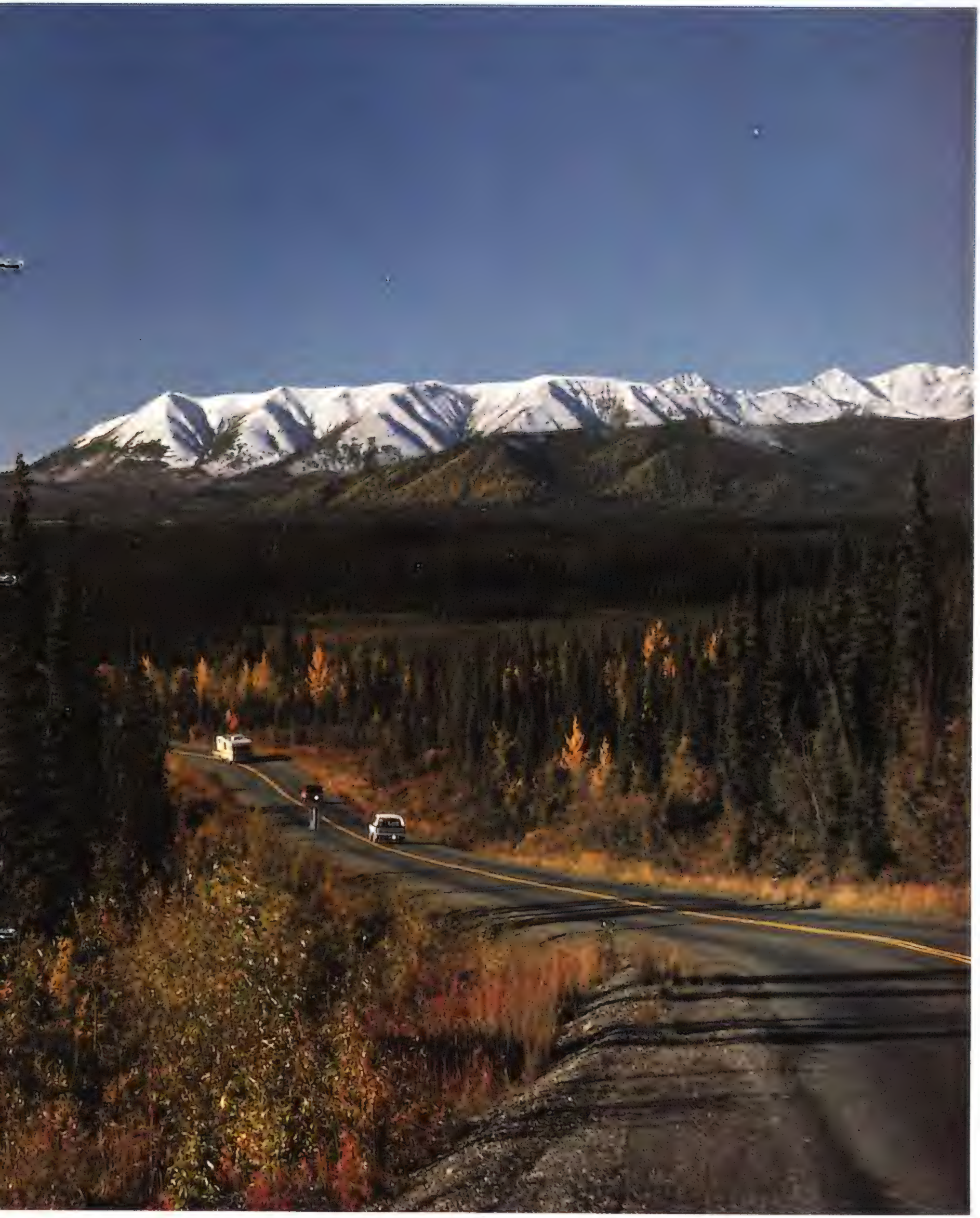
Shortly after leaving Toad River I picked up a middle-aged French couple, Roger and Chantal Rousse. They were hitchhiking to Kluane National Park in the Yukon. "We hope very much to see a grizzly bear," said Roger, "but not too close." Every few minutes as we drove along, Roger would gasp in excitement at a river or a mountain or a bird and exclaim, "Chantal, *regarde*!" At one point he declared in a voice thick with emotion, "There is so much nature on this road. I cannot believe every American and Canadian is not here to see it! In France we have some beautiful places, but there are people everywhere. You do not know how lucky you are to have such a large emptiness."

I had no quarrel with Roger on that point. If I had gotten out of my car and started walking north, I wouldn't have seen any sign of another human until I reached the Beaufort Sea, a distance greater than a thousand miles. It was a wilderness that felt eerily different from any other wilderness I'd come to know in Montana or Idaho or Oregon: it was so much bigger, so much lonelier, so much wilder.

The 50-year-old road I traveled across that wilderness seemed at times to roll along forever, like a dusty, potholed Möbius strip. More than once, I must confess, I wished to be done with the damned thing, to be soaking in a bathtub with a cold beer in my fist and the television tuned to a Seattle Mariners game. At such moments a strange little ditty would fill my head. I'd seen it scrawled on a bathroom wall back in Watson Lake: "Winding in and winding out / One begins to have some doubts / About the lout who built this route: / Was he going to hell? / Or coming out?"

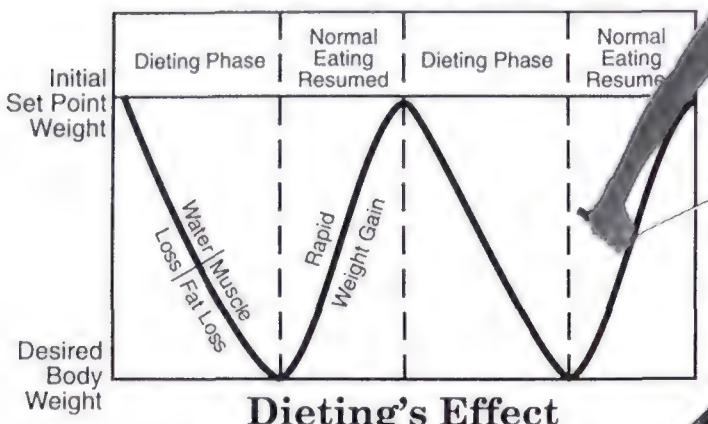


Crossing the Yukon, autos and recreational vehicles head up the highway toward Land of the Midnight Sun.



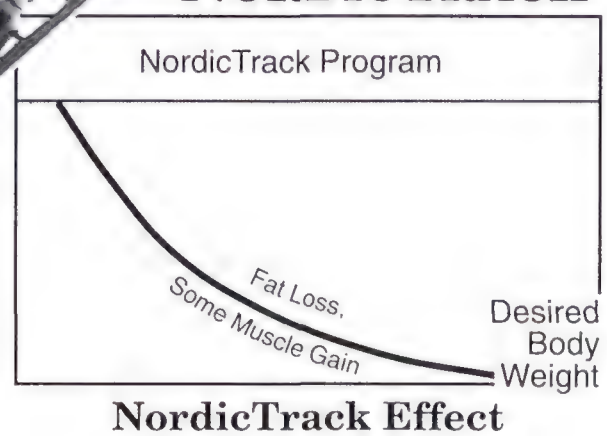
GET WEIGHT OFF AND KEEP IT OFF.

GET OFF THE DIET ROLLERCOASTER

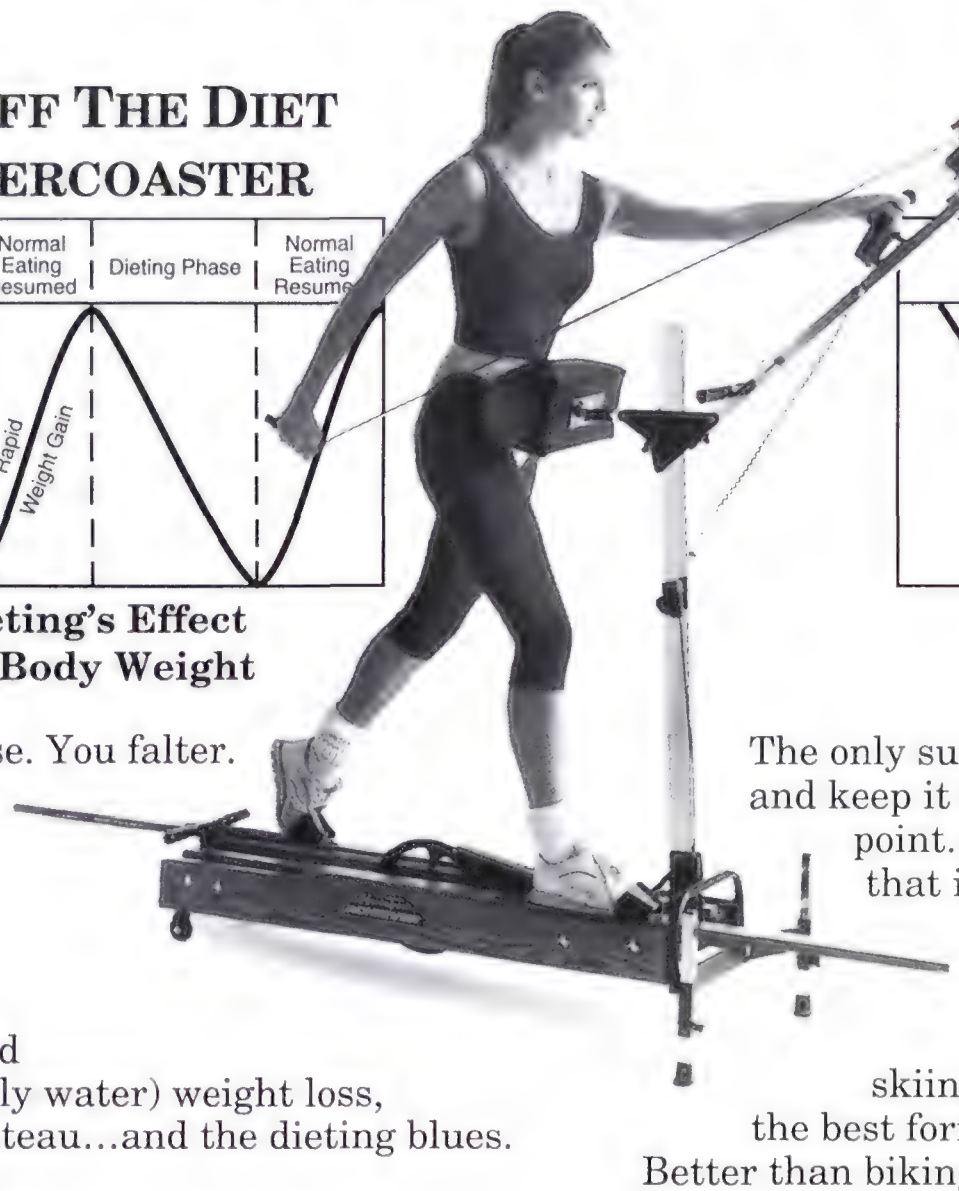


Dieting's Effect On Body Weight

GET ON TRACK WITH NORDICTRACK



NordicTrack Effect On Body Weight



You diet. You lose. You falter. You gain it back. Maybe a bit more. Discouraged, you begin the cycle over, destined for rapid initial (and mostly water) weight loss, followed by a plateau...and the dieting blues.

Why diets fail

Your body's system seeks to maintain the weight it considers "normal," what scientists call your *set point*. During dieting, your body fights back by increasing appetite and lowering metabolic rate. You feel uncomfortable and frustrated. You're in a battle you're bound to lose.

The only sure way to take body fat off and keep it off is to lower your set point. And the only way to do that is with aerobic exercise.

The NordicTrack® exerciser duplicates the motion of cross-country skiing, which experts agree is the best form of aerobic exercise. Better than biking, hydraulic cylinder rowing, running or swimming.

NordicTrack's jarless motion helps you avoid injury and utilizes all the major muscles in the body — arms, shoulders, back, stomach, legs — which means that not only do you take off body fat and keep it off, but you shape and tone those muscles as well.

Call today for a 30 day in-home trial!

Models priced from $299 to $1,299.

NordicTrack
A CML Company

Before you buy any in-home exerciser, consider the following:

NordicTrack is the one you'll use.

A recent independent survey has shown that NordicTrack owners who also own other exercise machines prefer their NordicTracks by a margin of more than 6 to 1.

NordicTrack is the one you'll stay with.

Research has also shown that NordicTrack owners who have owned their machines for more than five years still use them an average of three times per week.

Call today for a

FREE VIDEO

AND BROCHURE!

1-800-328-5888 EXT. 355G2

NordicTrack, Dept. 355G2,
141 Jonathan Blvd. N., Chaska, MN 55318

© 1992 NordicTrack, Inc., A CML Company All rights reserved.

By William Rathje and Cullen Murphy

Five major myths about garbage, and why they're wrong

A 20-year study suggests that we know way too little about what we toss out—and about what needs to be done with it

Illustrations by Margaret Scott

Would that it were possible to study garbage in the abstract. But, alas, garbage isn't mathematics. To understand garbage you have to touch it, to feel it, to sort it, to smell it. You have to pick through hundreds of tons of it, counting and weighing all the daily newspapers, the telephone books, the soiled diapers, the foam clamshells that once briefly held hamburgers, the lipstick cylinders coated with grease, the medicine vials still encasing brightly colored pills, the empty Scotch bottles, the half-full cans of paint and muddy turpentine, the forsaken toys, the cigarette butts. You have to sort and weigh and measure the volume of all the organic matter, the discards from thousands of plates: the noodles and the Cheerios and the tortillas; the pet food that made its own gravy; the hardened jelly doughnuts, bleeding

FINE PRINTS
ELEGANTLY FRAMED

Select the print, mat and frame of your choice while enjoying expert, quality craftsmanship. Choose from a variety of scenes featuring: New England, Nautical, Floral, Hunt, etc., custom-framed.

Free Catalogue, Call Today
1-800-841-4ART
FINE ART PRINTS, LTD.
P.O. BOX 3369, NEWPORT, RI 02840

MISSING A PIECE OF YOUR PATTERN?

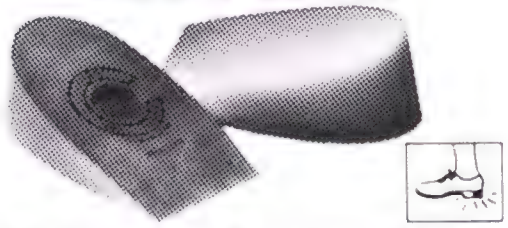
Now you can replace pieces or add to your sterling silver collection at up to 75% off retail prices. We specialize in new and used flatware and holloware, with over a thousand patterns in stock. Call or write for a free inventory of your sterling. *(We also buy sterling, with a careful appraisal for maximum value.)*

Pattern shown:
Chantilly by Gorham

Beverly Bremer
SILVER SHOP

3164 Peachtree Rd. NE, Dept. SM
Phone (404) 261-4009
Atlanta, GA 30305
Hours 10-5, Mon.-Sat

Do your heels ache?



Why suffer another day with sore heels (**and even heel spur aches**) when **Cushi-Heel Pillow** gives you quick relief **while you walk or run?** Developed by an athlete, who suffered just as you do, and who couldn't find anything which helped. His U.S. patented (No. 3,984,926) pads are exactly the right shape, density and compression to cushion the weight your heels must bear. Mailmen, housewives, waitresses, sales people, nurses, bartenders, school teachers, people who *must* be on their feet all swear by them. Joggers, tennis, golf, basketball and racquetball players find they can now play in comfort even with **heel spur** problems. **If not satisfied, return within 10 days for full and prompt refund.**

Calderon Products, Inc.
117 Fairlawn Plaza Drive, Dept. S13
P.O. Box 5387, Akron, OH 44334 • (216) 864-8100

☐ One pair Cushi Heel Pillows **$7.75** p.pd.
Save! Two pairs for only **$13.50** p.pd.
☐ Save more! Three pairs for only **$17.95** p.pd.

Fast delivery! Shipped by First Class Mail.
Enclosed: ☐ check ☐ money order ☐ cash
Visa – MasterCard holders (TO ORDER ONLY)
Call Toll Free 1-800-942-4000
24 hrs. a day, 7 days a week.
Ohio residents add 5¾% sales tax.
Specify shoe size:
Men's shoe size _____ Women's shoe size _____
Name _____
Address _____
City _____
State _____ Zip _____

from their side wounds: the half-eaten bananas, mostly still within their peels, black and incomparably sweet in the embrace of final decay.

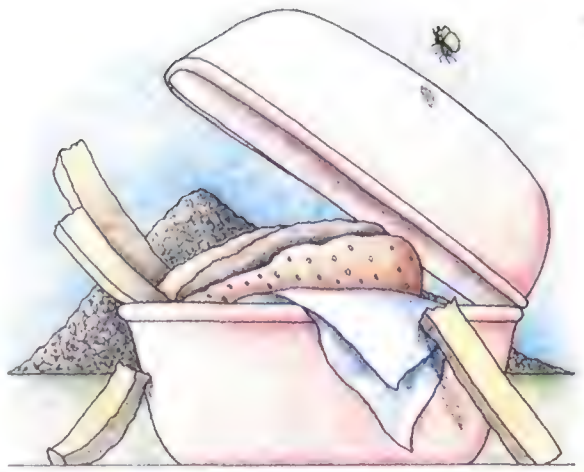
You have to confront sticky green mountains of yard waste, and slippery brown hills of potato peels, and ossuaries of brittle chicken bones and T-bones. And then, finally, there are the "fines," the vast connecting mixture of tiny bits of paper, metal, glass, plastic, dirt, grit and former nutrients that suffuses every landfill like a kind of grainy lymph. To understand garbage you need thick gloves and a mask and some booster shots. But the yield in knowledge offsets the grim working conditions.

To an archaeologist, ancient garbage pits, which usually can be located within a short distance of any ruin, are among the happiest of finds. Every archaeologist dreams of discovering spectacular objects—the Mask of Agamemnon, the Ark of the Covenant—but the bread-and-butter work of archaeology involves the most common and routine kinds of discards. It is not entirely fanciful to define archaeology as the discipline that tries to learn from old garbage.

The Garbage Project, conceived in 1971 and officially established at the University of Arizona in 1973, was an attempt to apply archaeological principles to a modern society: ours. Over the years some 750 people working for the project have processed more than 250,000 pounds of garbage—14 tons of it excavated from landfills (SMITHSONIAN, April 1990), the rest obtained fresh from the truck or the curb. Sorted, weighed, coded and catalogued, it has produced a unique database that yields all sorts of insights and questions about American life. Most notably the question of whether there is a garbage crisis at all.

Americans certainly do produce lots of garbage, and we have achieved

This article is adapted from William Rathje and Cullen Murphy's book Rubbish! The Archaeology of Garbage, *just published by HarperCollins.*



Contrary to popular perceptions, fast-food packages make up far less than 1 percent of most landfills.

no consensus about what to do with it. That *is* a big problem. But the work of the Garbage Project underscores a second problem, one that helps explain why we have been unable to deal with the first problem: much conventional wisdom about garbage and its disposal consists of myths and assertions that turn out, upon investigation, to be misleading—or dead wrong.

Myth No. 1: Fast-food packaging, polystyrene foam and disposable diapers are major constituents of American garbage.

Over the years, Garbage Project researchers have asked people who have never seen the inside of a landfill to estimate what percentage of a landfill's contents is made up of fast-food packaging, expanded polystyrene foam and disposable diapers. In September of 1989 this very question was asked of a group attending the biennial meeting of the National Audubon Society, and the results were generally consistent with those obtained from surveys at universities, business meetings, and conferences of state and local government officials.

Estimates of the volume of fast-food packaging fell mainly between 20 and 30 percent of a typical landfill's contents; of expanded polystyrene foam, between 25 and 40 percent; of disposable diapers, between 25 and 45 percent. The overall estimate, then, of the proportion of a landfill's contents taken up by the three types of garbage together ranged from a suspi-

ciously high 70 percent to an obviously impossible 115 percent.

The physical reality inside a landfill is, in fact, quite different. Of the 14 tons of garbage from nine municipal landfills that the Garbage Project has excavated and sorted in the past five years, there was less than a hundred pounds of fast-food packaging—that is, containers or wrappers for hamburgers, pizzas, chicken, fish and convenience-store sandwiches, as well as the accessories most of us deplore, such as cups, lids, straws, sauce containers, and so on.

In other words, less than one-half of 1 percent of the weight of the materials excavated from landfills consisted of fast-food packaging. As for the amount of space that fast-food packaging takes up—a more important consideration than weight—the Garbage Project estimate is that fast-food packages account for no more than one-third of 1 percent of the total volume of the average landfill's contents.

What about expanded polystyrene foam? The stuff is, of course, used for many things. But only about 10 percent of all foam plastics manufactured during the past decade was used for fast-food packaging. Most foam was (and is) blown into egg cartons, meat trays, coffee cups, lightweight "peanuts" for packing delicate things, and the intriguing molded forms that keep electronic appliances safe in their shipping cases. Judging from the results of detailed landfill excavations, all the expanded polystyrene foam that is thrown away in the United States every year accounts for no more than 1 percent of the volume of landfilled garbage.

Expanded polystyrene foam, nevertheless, has been the focus of many vocal campaigns to ban it outright. It is worth remembering that if such foam were banned, the relatively small amount of space that it takes up in landfills would not be saved. Eggs, hamburgers, coffee and stereos must still be put in something.

When it comes to disposable diapers, some startling numbers do get bandied about. In 1987 the Portland *Oregonian* reported that disposable diapers made up one-quarter of the contents of local landfills. According to another estimate used by government agencies in recent years, disposable diapers constitute about 12 percent of total trash. These numbers are not, in fact, correct. The Garbage Project has consistently found that, on average, disposable diapers make up no more than 1 percent by weight of a typical landfill's total solid-waste content—and no more than 1.4 percent by volume.

Fast-food packaging, foam and disposable diapers have acquired high visibility because they are so noticeable among casual litter, and people think the components of everyday litter are the same as landfilled garbage. As a result, these items have become powerful symbolic targets. But if they disappeared tomorrow, landfill operators would hardly notice.

Myth No. 2: Plastic is also a big problem.

For the record, it should be noted that the item most frequently encountered in landfills is plain old paper—it accounts for more than 40 percent of a landfill's contents; this proportion has

The proportion of space taken up by plastics in some landfills has actually decreased because of light-weighting.

Free Catalog
Bargain Books
Save up to 80% on recent overstocks, remainders, imports and reprints from all major publishers. Choose from up to 8,000 titles including 600-1,500 new arrivals each month! Biography, History, Fiction, Politics, Art, Science, Gardening, Cooking—something for everyone. An immense selection and with more books at $1.95, $2.95, $3.95 than you'll find anywhere else. Fast shipment, moneyback guarantee. Write for free Catalog:
HAMILTON
Box 15-675, Falls Village CT 06031

SAFARI ADVENTURES
EXPLORE AFRICA
2 WEEKS $2474
Experience exotic Kenya from the comfort of our own aircraft, safari lodges and magnificent beach hotels !
AFRICAN SAFARI CLUB • 1-800-544-0934
2170 S.E. 17th St. #303 Ft. Lauderdale, FL 33316

LEATHER BOOK BAG ONLY $189
Call 1-800-999-1920 Order today!

CRUISE CALM CANADIAN RIVERS
ABOARD OUR ELEGANT REPLICA
TURN-OF-THE-CENTURY STEAMSHIPS
ST. LAWRENCE CRUISE LINES INC.
1-800-267-7868

SHELL BRACELET
#4-H, sterling: $83 ppd.
14K: $726 ppd.
Links actual size 7" long
Gift boxed, satisfaction guar.
MC, VISA, AMEX, ck or M.O.
1-800-67-TORYS. M-F, 9-5, EST.
TORYS
Fax: 1-617-631-9828
Catalog upon request.
106 Washington St., Dept. S, Marblehead, MA 01945

World's Largest Bronze Supplier
FREDERIC REMINGTON
BRONZE COLLECTION

BRONCO BUSTER..... $140
"Lost wax casting"
HENRY BONNARD BRONZE CO. AND ASSOCIATES
4305 S. Highway 17-92
Casselberry, FL 32707
407-339-9103
1-800-521-3179
Call or Write for Catalog
Marble bases and shpg. & hdlg. additional

Swim without limits.

Call to learn more about our line of counter-current swimming machines for your home or existing pool.

1-800-732-8660

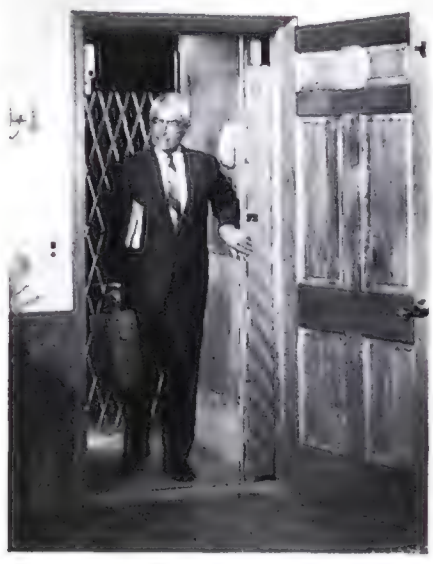
ENDLESS POOLS™ SWIMMING MACHINES
200 E. Duttons Mill Rd.
Aston, PA 19014

GALÁPAGOS

You, 9 other adventurers and our licensed naturalist will sail by yacht to explore more islands than any other Galápagos expedition. 60 trip dates. Machu Picchu option. Free brochure.

Inca Floats 510-420-1550
1311-S 63rd St., Emeryville CA 94608

"Elevette" Practical Luxury.



More and more homeowners are discovering the practical luxury of "Elevette," the custom-built residential elevator. It's the perfect solution for those who shouldn't climb stairs. It's the ultimate in convenience. And it's tax-deductible when recommended by a doctor.
For more information on the "Elevette," write:

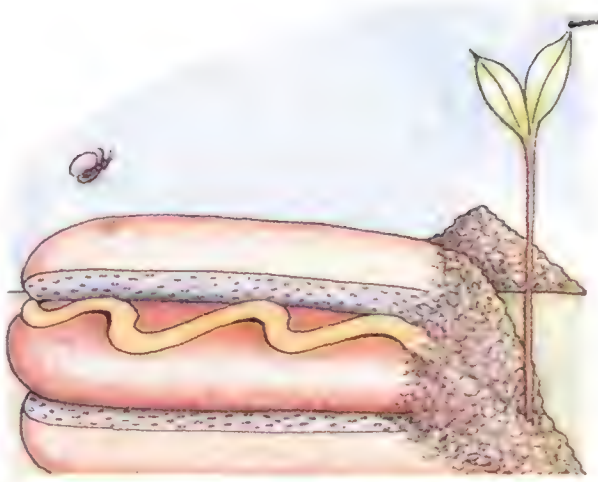
INCLINATOR COMPANY OF AMERICA
Dept. 4
P.O. Box 1557
Harrisburg, PA 17105-1557

held steady for decades and in some landfills has actually risen. Newspapers alone may take up as much as 13 percent of the space in American landfills. A year's worth of copies of the *New York Times* has been estimated to be equivalent in volume to 18,660 crushed aluminum cans or 14,969 flattened Big Mac clamshells.

There was a lot of talk some years ago about how technology, computers in particular, would bring about a "paperless office"—a risky prediction given the already apparent increase caused by the photocopy machine. Today there are 59 million personal computers in the United States with printers attached. Where the creation of paper waste is concerned, technology is proving to be not so much a contraceptive as a fertility drug.

That said, what is the situation with respect to plastic? In landfill after landfill excavated by the Garbage Project, the volume of all plastics—foam, film and rigid; toys, utensils and packages—amounted to between 20 and 24 percent of all garbage, as sorted; when compacted along with everything else, as it is in landfills, the volume of plastics fell to only about 16 percent.

Even if plastics' share of total garbage is, at the moment, fairly low, isn't it true that plastics take up a larger and larger proportion of landfill space with every passing year? Unquestionably, a larger number of physical objects are made of plastic today than were in 1970, or 1950. But a curious phenomenon becomes apparent when garbage deposits from our own time are compared with those from landfill strata characteristic of, say, the 1970s. While the *number* of individual plastic objects to be found in a deposit of garbage of a given size has increased considerably in the course of a decade and a half—more than doubling—the *proportion* of landfill space taken up by those plastics has not changed; at some landfills the proportion of space taken up by plastics was actually a little less in the 1980s than in the '70s.



Decades after they were interred in a landfill, hot dogs were found to be recognizable—though unappetizing.

The explanation appears to be the result of what is known in the plastics industry as "light-weighting"—making objects in such a way that the object retains all the necessary functional characteristics but requires the use of less resin. The concept of light-weighting is not limited to the making of plastics; the makers of glass bottles have been light-weighting their wares for decades, with the result that bottles today are 25 percent lighter than they were in 1984.

Using fewer raw materials for a product that is lighter and therefore cheaper to transport usually translates into a competitive edge, and companies that rely heavily on plastics have been light-weighting ever since plastics were introduced. Soda bottles made of polyethylene terephthalate (PET) weighed 67 grams in 1974; today they weigh 48 grams. In the mid-'60s high-density polyethylene milk jugs weighed about 120 grams; today the number is 65. Plastic grocery bags had a thickness of 30 microns in 1976; the thickness today is at most 18 microns. Even the plastic in disposable diapers has been light-weighted, although the superabsorbent material that was added at the same time (1986) ensures that while diapers may enter the house lighter, they will leave it heavier than ever. In most cases, when plastic gets lighter, it also gets thinner and more crushable. The result is that many more plastic items can be squeezed into a given volume

of landfill space today than could fit 10 or 20 years ago.

Myth No. 3: A lot of biodegradation takes place in modern landfills.

Plastic is the Great Satan of garbage: gaudy, cheap, a convenient scapegoat for people who claim we waste and consume too much. Although it is paper more than anything else that is filling up landfills, in paper's defense one frequently hears: Well, at least paper biodegrades; plastic remains inert and will take up space in a landfill until the end of time.

Not really.

Misconceptions about the interior life of landfills are profound—not surprisingly, since so very few people can (or would want to) venture inside one. There is a popular notion that in the depths of a typical municipal landfill lies a roiling caldron of fermentation—intense chemical and biological activity. That perception is accompanied by a certain ambivalence. Landfills are seen, on the one hand, as places where organic matter is rapidly breaking down—biodegrading—into a sort of rich, moist brown humus, returning at last to the bosom of Mother Nature. In this view, biodegradation is something devoutly to be wished, an environmentally correct outcome of the first magnitude. On the other hand, coexisting with the romance of biodegradation, there is the view of landfills as environments from which a toxic broth of chemicals leaches into the surrounding soil, polluting groundwater and nearby lakes and streams. What both views have in common is the assumption that a great deal of biodegradation is taking place.

Well, some biodegradation *is* taking place—otherwise landfills would produce none of the large amounts of methane and trace amounts of other gases that they do in fact produce. In reality, however, the dynamics of a modern landfill are very nearly the opposite of what most people think. Biologically and chemically, a landfill is much more static than we commonly suppose. For some kinds of organic garbage, biodegradation goes on for a while and then slows to a virtual standstill. For other kinds, biodegradation never gets under way at all.

Biodegradation was the target of a major Garbage Project research program. The first question observers set out to answer was: After a period of 10 or 15 years, is there much identifiable paper and other organic debris remaining in a typical landfill? Or has it mostly been transformed into methane and humus? Landfills vary, of course, but when the paper items are combined with food waste, yard waste and wood (mostly lumber used in construction), the overall volume of old organic material recovered largely intact from the landfills excavated by the Garbage Project turned out to be astonishingly high.

For example, at the Mallard North Landfill, outside Chicago, organics represented 50.6 percent of the 10-to-15-year-old garbage excavated. Some 40 percent of 25-year-old garbage at Sunnyvale Landfill, near San Francisco, was organic. And at the Rio Salado Landfill, near Phoenix, organics totaled nearly 50 percent of the excavated garbage that dated back to the 1950s.

Almost all this material remained readily identifiable: pages from coloring books were still clearly that; onion parings were onion parings, carrot tops were carrot tops. In the course of every excavation the Garbage Project has done, whole hot dogs have been

Some Northeastern cities are running out of sites for landfills, but across the United States there's plenty of space.

OLD WEST
OUTFITTERS
DIRECT MERCHANTS OF AUTHENTIC FRONTIER DRY GOODS
CATALOG
CLOTHING • HATS • BOOTS
VESTS • LEATHER GOODS • ETC.
1-800-447-5277
7213 East First Avenue
Scottsdale, Arizona 85251

Cartouche, Ltd.
18K Solid Gold or Sterling Silver
HANDMADE EGYPTIAN CARTOUCHES
Cartouche
The perfect personalized gift
A handmade pendant with *your name* in Ancient Egyptian Hieroglyphics
Full line of Egyptian Jewelry available!
Call for FREE Brochure
1-800 AT EGYPT
or write
CARTOUCHE, LTD.
Box 8474-1 Pgh., PA 15220
Visa • MC • Am-Ex • Disc.
PEACE

Certain gifts must simply be extraordinary
THE FAMOUS
Stave Jigsaw Puzzles
Since 1974, the finest handcut personalized wooden jigsaw puzzles being made today. $95 - $2000. Call or write for free catalog. Stave Puzzles, Box 329S, Norwich, VT 05055 ☎ 802-295-5200

BLACKWATER GALLERY
Specializing in Fine Tribal Arts from New Guinea, Indonesia, Irian Jaya
Write for free price list
3703 Parkridge Dr.
Rapid City, SD 57702

HAND CARVED MAHOGANY JET FIGHTERS
F-14 TOMCAT
• 16" to 22" models are hand-crafted from solid mahogany with handpainted markings and details
• Over 160 models in stock
• Priced from $99.50
• Satisfaction guaranteed
Call 1-800-950-9944
PACIFIC AIRCRAFT
WORLD'S LEADING MAKERS OF FINE AEROSCULPTURES
14255 North 79th Street
Scottsdale Airpark, AZ 85260
(602) 991-1841

found, some of them in strata suggesting an age upwards of several decades. From the newspapers in America's landfills you could relive the New Deal.

The picture of biodegradation that emerges from these and other Garbage Project investigations is something like the following. Under normal landfill conditions—in which garbage is covered with dirt after being dumped, and the landfill is kept relatively dry—the only types of garbage that truly decompose are certain kinds of food and yard waste. And these obligingly biodegradable items account for less than 10 percent of the average landfill's contents. Even after two decades, a third to a half of supposedly vulnerable organics remain in recognizable condition. This portion may continue to experience biodegradation, but at a snail's pace.

That finding accords with what is known of the typical life cycle of a field of methane wells, which are drilled to draw gas out of landfills. For 15 or 20 years after a landfill has stopped accepting garbage, the wells vent methane in fairly substantial amounts. Then methane production drops off rapidly, indicating that the landfill has stabilized. Henceforth, it would seem, whatever is in the landfill won't be changing very much.

Well-designed and well-managed landfills, in particular, seem to be far more apt to preserve their contents for posterity than to transform them into humus or mulch. They are not vast composters; rather, they are vast mummifiers. But no need to panic. This may be a good thing. For while there are advantages to biodegradation, it is unquestionably true that the more things decompose in a landfill, the more opportunities there will be for a landfill's noxious contents to come back and haunt us.

Myth No. 4: America is running out of safe places to put landfills.

There can be no disputing the fact that there is, for the time being, an acute shortage of landfills that are still available for deposits, especially in the Northeastern United States. Since 1978, according to the Environmental Protection Agency, some 14,000 landfills have been shut down nationwide (leaving some 6,000 in operation). Still, as the University of Pennsylvania's waste-management expert, Iraj Zandi, has shown, these figures somewhat overstate the problem. Many of the shut-down "landfills" were actually open dumps being closed for environmental reasons. And whatever the nature of the sites, they have tended to be relatively small, whereas those that remain open are quite large.

In 1988, for example, 70 percent of the country's landfills—the smaller ones—handled less than 5 percent of the municipal solid waste that was landfilled nationwide; that same year, fewer than 500 landfills, or about 8 percent of the total—the bigger ones—handled nearly 75 percent of our landfilled garbage. "It appears," Zandi writes, "that the trend is toward operating fewer but larger landfills. This

Do you ever get motion sickness? You know that queasy, nauseous, dizzy feeling?

© 1992 Ciba Consumer Pharmaceuticals

phenomenon coincides with the trend in the rest of the industrialized world." As of 1990, some 42 percent of all landfills were under 10 acres in size, 51 percent were between 10 and 100 acres, and 6 percent were larger than 100 acres. Regionally, of course, the situation is in many cases dire. In New Jersey (pop. 7.7 million), the number of landfills has dropped from more than 300 to about a dozen during the past 15 years.

The customary formulation of the problem that we face is that within the next five years 50 percent of the landfills now in use will close down. Describing the situation this way makes it seem as if Americans have somehow speeded up the throwaway society. As it happens, it has always been the case that half of all landfills in use at any given time will close within five years. It was true back in 1970 and in 1960, too, because the waste-management industry has never seen the need to maintain excess capacity beyond a certain level. In the past, however, new landfill capacity was rarely hard to obtain. The difference today is not that we're filling up landfills at a rapidly increasing pace, but that in many places used-up capacity is simply not being replaced.

Why aren't more permits being granted? The reasons usually have nothing to do with the claim most frequently offered: We are running out of room for landfills. Yes, it is sometimes the case that a community or a state has run out of room. In the congested Northeast there is not all that much space left for landfills, at least not safe ones. In the nation as a whole, however, there is room aplenty. The United States is a big country, heavily urbanized but with enormous tracts of empty countryside.

In a study published by the Washington-based think tank Resources for the Future, economist A. Clark Wiseman has calculated that at the current rate of waste generation, all of America's garbage for the next 1,000 years would fit into a single landfill space only 120 feet deep and 44 miles square—a patch of land about the size of three Oklahoma Citys.

So vast a landfill is, for any number of reasons, completely impractical, of course. The point here is simply that the total amount of space necessary will not be all that large. Few nations are as substantially endowed with uncongested territory as ours is, and there is appropriate land available even in some relatively populous areas. Recently, Browning-Ferris Industries, one of the nation's two biggest full-service garbage disposal companies, commissioned an environmental survey of eastern New York State with the express aim of determining where landfills might safely be located. The survey pinpointed sites that represented 200 square miles of territory—which constituted only 1 percent of the region's land area. Yet with all this available land, the state has, since 1982, closed down 349 landfills and opened only 6.

The obstacles to new sanitary land-

Not a lot of fun, is it?

Now you can prevent motion sickness with TRANSDERM SCŌP.®
(scopolamine 1.5 mg.)

Your body goes one way, your stomach goes the other. Your eyes say you're going up, the rest of you says you're going down. That's how motion sickness feels. That's how an enjoyable boat ride, ocean cruise or flight turns into pure misery. That's when Transderm Scōp can help.

Nothing else works like the Transderm Scōp Patch.

The Transderm Scōp medicated patch is a totally unique motion sickness prevention system—and it really works. You wear it behind your ear to get continuous, effective protection from motion sickness. Advanced transdermal technology provides medication at a controlled, steady rate. Simply apply at least four hours before needed.

Each patch works for up to three days, so you never have to worry about the protection wearing off at just the wrong time. When you don't need protection any more, just remove it.

Transderm Scōp is a prescription product for adults only that has been clinically tested, proving it safe and effective. Even so, it can have some side effects. Dryness of the mouth occurs in two-thirds of users. As with many medications, drowsiness may occur (affecting less than one in six) and users are warned against driving or operating dangerous machinery. Use with special care in the elderly and avoid drinking alcohol while using the product. See adjoining page for additional information on possible adverse reactions or side effects.

Call your doctor about Transderm Scōp.

Doctors know that Transderm Scōp is an effective way to prevent motion sickness. That's why doctors have prescribed Transderm Scōp millions of times. So, to avoid all that misery and enjoy your next trip, just ask your doctor about getting the patch. Because when that boat starts to roll, when that plane starts to pitch—well, you'll be glad you discovered Transderm Scōp.

Proven protection from motion sickness.

Proud Contributor to AMERICA' Competitors in defense of America's Cup '92

TRANSDERM SCÓP® (scopolamine 1.5 mg.)
MOTION SICKNESS PREVENTION PATCHES.

INDICATIONS AND USAGE
Transderm Scop is indicated for prevention of nausea and vomiting associated with motion sickness in adults. The patch should be applied only to skin in the postauricular area.

CONTRAINDICATIONS
Transderm Scóp should not be used in patients with known hypersensitivity to scopolamine or any of the components of the adhesive matrix making up the therapeutic system, or in patients with glaucoma.

WARNINGS
Transderm Scóp should not be used in children and should be used with special caution in the elderly. See **PRECAUTIONS.**

Since drowsiness, disorientation, and confusion may occur with the use of scopolamine, patients should be warned of the possibility and cautioned against engaging in activities that require mental alertness, such as driving a motor vehicle or operating dangerous machinery.

Potentially alarming idiosyncratic reactions may occur with ordinary therapeutic doses of scopolamine.

PRECAUTIONS
General. Scopolamine should be used with caution in patients with pyloric obstruction, or urinary bladder neck obstruction.

Caution should be exercised when administering an antiemetic or antimuscarinic drug to patients suspected of having intestinal obstruction.

Transderm Scóp should be used with special caution in the elderly or in individuals with impaired metabolic, liver or kidney functions, because of the increased likelihood of CNS effects.

Information for Patients. Since scopolamine can cause temporary dilation of the pupils and blurred vision if it comes in contact with the eyes, patients should be strongly advised to wash their hands thoroughly with soap and water immediately after handling the patch.

Patients should be advised to remove the patch immediately and contact a physician in the unlikely event that they experience symptoms of acute narrow-angle glaucoma (pain in and reddening of the eyes accompanied by dilated pupils).

Patients should be warned against driving a motor vehicle or operating dangerous machinery. A patient brochure is available.

Drug Interactions. Scopolamine should be used with care in patients taking drugs, including alcohol, capable of causing CNS effects. Special attention should be given to drugs having anticholinergic properties, e.g., belladonna alkaloids, antihistamines (including meclizine), and antidepressants.

Carcinogenesis, Mutagenesis, Impairment of Fertility. No long-term studies in animals have been performed to evaluate carcinogenic potential. Fertility studies were performed in female rats and revealed no evidence of impaired fertility or harm to the fetus due to scopolamine hydrobromide administered by daily subcutaneous injection. In the highest dose group (plasma level approximately 500 times the level achieved in humans using a transdermal system), reduced maternal body weights were observed.

Pregnancy Category C. Teratogenic studies were performed in pregnant rats and rabbits with scopolamine hydrobromide administered by daily intravenous injection. No adverse effects were recorded in the rats. In the rabbits, the highest dose (plasma level approximately 100 times the level achieved in humans using a transdermal system) of drug administered had a marginal embryotoxic effect. Transderm Scóp should be used during pregnancy only if the anticipated benefit justifies the potential risk to the fetus.

Nursing Mothers. It is not known whether scopolamine is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when Transderm Scóp is administered to a nursing woman.

Pediatric Use. Children are particularly susceptible to the side effects of belladonna alkaloids. Transderm Scóp should not be used in children because it is not known whether this system will release an amount of scopolamine that could produce serious adverse effects in children.

ADVERSE REACTIONS
The most frequent adverse reaction to Transderm Scóp is dryness of the mouth. This occurs in about two thirds of the people. A less frequent adverse reaction is drowsiness, which occurs in less than one sixth of the people. Transient impairment of eye accommodation, including blurred vision and dilation of the pupils, is also observed.

The following adverse reactions have also been reported on infrequent occasions during the use of Transderm Scóp: disorientation, memory disturbances, dizziness, restlessness, hallucinations, confusion, difficulty urinating, rashes and erythema, acute narrow-angle glaucoma, and dry itchy, or red eyes.

Drug Withdrawal: Symptoms including dizziness, nausea, vomiting, headache and disturbances of equilibrium have been reported in a few patients following discontinuation of the use of the Transderm Scóp system. These symptoms have occurred most often in patients who have used the systems for more than three days.

Dist. by CIBA Consumer Pharmaceuticals
Division of CIBA-GEIGY Corp.
Summit, New Jersey 07901

CIBA

fills these days are to some extent monetary—landfills are indeed expensive. But more important, the obstacles are psychological and political. Nobody wants a garbage dump in his or her backyard. It is ironic. We have convinced ourselves that our big flaw is that we are wasteful and profligate, while a much more serious flaw goes unnoticed: as a nation, on the subject of garbage, at least, we have become politically impotent.

Myth No. 5: On a per-capita basis, Americans are producing garbage at a rapidly accelerating rate.

Not much comparable data is available on garbage-generation rates during different periods of time, but what little there is does not support the view that per-capita rates have steadily accelerated. Garbage Project sortings of large amounts of household garbage in Milwaukee during the late '70s found that households there threw out garbage at a rate of about a pound and a half per person per day. Fortuitously, data exists for Milwaukee from a period 20 years earlier—1959, specifically. A study done at the time for a doctoral dissertation in environmental engineering by John Bell of Purdue University found that Milwaukee households were throwing away slightly more garbage than were their 1970s counterparts: about 1.9 pounds per person per day. Admittedly, this estimate involved only household waste, not the larger category of municipal solid waste. But household waste is by far the largest contributor to municipal solid waste, and the Milwaukee comparison at least deserves a place in the evidence pile.

Looking at the matter another way, let us assume that the Environmental Protection Agency is right when it estimates that the average American throws out about 1,500 pounds of garbage a year. That certainly seems like a lot. History reminds us, though, that many former components of American garbage no longer exist—major components whose absence does not

Though they are unsightly, diapers are but a tiny percentage of total trash.

even register in the collective memory. Thus, we do not see the 1,200 pounds per year of coal ash that the average American generated from home stoves and furnaces at the turn of the century—and usually dumped on the poor side of town. We do not see the more than 20 pounds of manure that each of the more than three million horses living in cities produced every day at the turn of the century, or the hundreds of thousands of dead horses that cities had to dispose of every year. We do not see all the food that households once wasted willy-nilly because refrigeration and sophisticated packaging were not yet widespread.

It is undeniable that Americans as a whole are producing more municipal solid waste than they did 50 or 100 years ago. But this is largely because there are more Americans than there were 100 or even 50 years ago (63 million in 1890, 132 million in 1940, 248 million now).

These days, debates swirl about the fine points of per-capita garbage-generation rates and whether they've been going up slightly year by year in recent decades, and by how much. Certainly, wars, recessions and social innovation (for example, the advent of curbside recycling) cause yearly variations in the solid-waste stream,

though in ways that economists and social scientists cannot yet accurately describe. But a long view of America's municipal solid waste would suggest that, on a per-capita basis, the nation's record is hardly one of unrestrained excess. Indeed, the word that best describes the situation with respect to overall volume may be "stability."

If the work of the Garbage Project seems somewhat reassuring, the reassurance is an unsatisfying kind: it suggests that we may not be quite as bad as we thought, that our problems are perhaps not quite as terrible as we believed. But the disposal of garbage remains a matter in need of serious attention. And the most critical part of the garbage problem in America may be that our notions about the creation and disposal of garbage are riddled with misconceptions. We go after glamorous symbolic targets rather than the serious but mundane ones. Impelled by a sense of crisis, we make hasty decisions when nothing about the situation warrants anything but calm. We castigate ourselves for certain imperfections but not for the ones that really matter.

And we lose sight of fundamentals. The solid-waste stream has not suddenly become a raging torrent. The means we have for disposing of garbage—in landfills, through incineration, through recycling—have never been safer or more technically advanced. And since the late 19th century, America's record with respect to garbage disposal has been one of gradual improvement. It remains to be seen whether this record can be sustained in the face of not-in-my-backyard outrage that has led to political impasse on solid-waste issues all over the country.

What should be done? To a certain extent, that depends on where you are. Conditions vary. In the future, a congested place like New York City, hemmed in by suburbs, will have to burn its garbage, whereas a place like Tucson, in open country, will probably be able to rely on landfills forever.

INQUIRIES?

- Change of address
- Dues payment
- Gifts
- Report missing issues
- Correspond about related matters

Write to:

SMITHSONIAN
MEMBERSHIP-SUBSCRIPTION
DATA CENTER
P.O. BOX 55593
BOULDER, CO 80322-5593
TELEPHONE (303) 449-9609

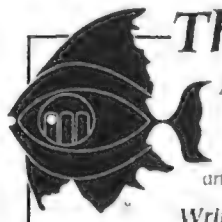
Please include address label from recent issue.

Plains Indian art, crafts and jewelry.

Coastal education catalog shows over 100 beautiful exceptional examples of buffalo skulls, bow and arrow sets, feather pieces, beaded bags and silk scarves, dolls, cradle boards, dance sticks, dolls, ceremonial pipes, turtle shells, concho belts, tomahawks, bear claws, sweet grass, cedar bundles, and collector's items from traditional to unique. All are hand made with authentic materials. Catalog tells the fascinating story of each item's place in Native American life. For your copy, send $3.00.
Most major credit cards accepted.

PRAIRIE EDGE DEALER INQUIRIES INVITED

Call 1-800-541-2388; fax (605)341-6415 or write to:
Prairie Edge, P.O. Box 8303, Dept. SM2, Rapid City, SD 57709-8303
VISIT OUR GALLERIES IN SANTA FE, N.M., RAPID CITY, S.D. AND STURGIS, S.D.



The Artful Fish

A catalog of Fine Fish Exotica for true 'afishionados'!

Lithographs, seafood cookery, wearable art, jewelry, toys, books, —everything FISH!

Write or call today for your free copy!

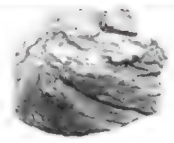
P.O. Box 40-F • Santa Cruz, CA 95063 • 1-800-525-6777

Communism is DEAD ...but not forgotten

Authentic, collectable, Soviet*propaganda*pin set. 2 communist, 2*free Russia* lapel pins in display case. This Russian made set marks the most historic change of our era.
SUPPLIES LIMITED
$21.95 PPD, Send check/MO to: NADCO
9120 W 4th Pl, Lakewood CO, 80226
or: VISA/MC ORDERS 800/77-LENIN

The Evolution of Strength Training

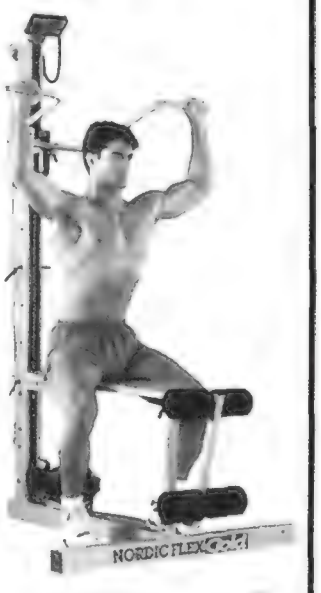
NordicFlex Gold™ Marks the Ultimate Evolution of Strength Training Equipment.



Stone Weights
5,000 B.C.

Dumbbells
1894

Soloflex®
1978



NordicFlex Gold™
1991

Advanced Technology has made NordicFlex Gold™ 5 ways better than Soloflex®.

1. **NordicFlex Gold** has linear motion to better simulate free-weights.
2. **NordicFlex Gold** has isokinetic resistance to better match your natural strength curve.
3. **NordicFlex Gold** is faster to use than Soloflex®.
4. **NordicFlex Gold** has electronics to monitor your performance.
5. And, best of all, **NordicFlex Gold** costs 1/3 less than Soloflex®.

Call today for a 30-day, in-home trial. NORDIC FLEX Gold

FREE VIDEO and brochure 1-800-445-2360 EXT. 91KG2

Or write: NordicTrack, Dept. #91KG2, 141 Jonathan Blvd. N., Chaska, MN 55318

©1991 NordicTrack, Inc., A CML Company, Soloflex is a registered trademark of Soloflex, Inc. All rights reserved

Special Care for Special People

Progressive education, home environment for the mentally handicapped child and adult. Opportunity for educational progress at any age – multiple recreational and social activities. A year-round program with an active and full lifestyle among friends on a 600-acre bluegrass estate. Est. 1893. Phone 502-875-4664 or write

THE STEWART HOME SCHOOL
Box 96, Frankfort, KY 40601
John P. Stewart, M.D., Resident Physician

Windjammer!
Exciting 'Sneak-Aways'
Under Glorious Sail
Out O' Mystic,
Box 487, Mystic, CT 06355
Reservations 1-800-243-0416

BOTHERED BY MOSQUITO BITES?

You will feel comfortable going outdoors when you wear THE NEW MOLTRON III BUG SHIELD™. This electronic device emits a barely audible sound that actually repels biting mosquitoes. The sound is harmless to people and pets. Developed and tested by Swiss Entomologists. Use wherever biting insects are present. Wear it, place on table or nightstand, or in the baby's stroller.

ACTUAL HEIGHT 2¾

ENVIRONMENTALLY CORRECT • NO CHEMICALS
SWISS TECHNOLOGY • NO ODOR • NON TOXIC
ASSEMBLED IN U.S.A. • BATTERIES INCLUDED
KEEPS BITING INSECTS 4'-6' AWAY
30 DAY MONEY BACK GUARANTEE

ONLY **$19.95** + $3.25 S & H

ORDER TODAY: VISA/MC/CK/M.O.
PROFESSIONAL SPORTS MARKETING, INC
336 MAIN STREET: DEPT. S792
ST. LOUIS, MO 63021
M-F 800-332-5687 • FAX 314-394-5560

Want to brush up on a foreign language?

With Audio-Forum's intermediate and advanced materials, it's easy to maintain and sharpen your foreign-language skills.

Besides intermediate and advanced audio-cassette courses – most developed for the U.S. State Department – we offer foreign-language mystery dramas, dialogs recorded in Paris, games, music, and many other helpful materials. And if you want to learn a new language, we have beginning courses for adults and for children.

We offer introductory and advanced materials in most of the world's languages: French, German, Spanish, Italian, Japanese, Mandarin, Greek, Russian, Arabic, Korean, and others. 215 courses in 76 languages. Our 20th year.

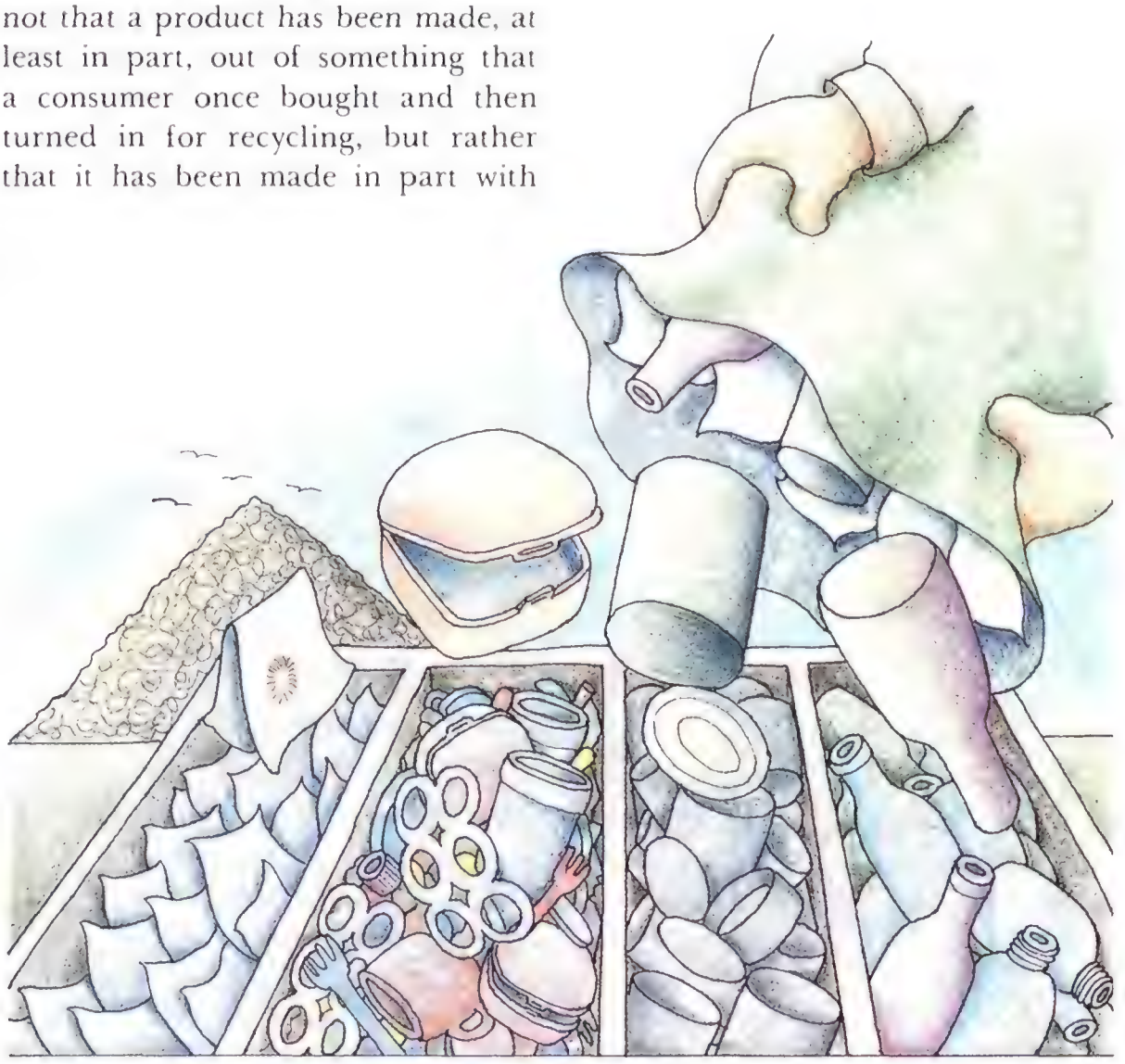
Call 1-800-551-6300 for FREE 36-page catalog, or write:

AUDIO-FORUM®
Room F 725 , 96 Broad Street,
Guilford, CT 06437 (203) 453-9794

Whatever the disposal means that are selected, we should be willing to pay prorated fees for the collection and disposal of nonrecyclable garbage. Charging a fee for nonrecyclable garbage thrown away, while not charging for recyclable refuse, has precisely the effect economic theory would predict: recycling rates improve, and the overall volume of nonrecyclable garbage diminishes. This system, tried in cities like Seattle, works. Adopted on a broad scale, the impact will ripple backward, encouraging manufacturers to use less packaging and to make products with ease of recycling in mind.

We should buy goods and packaging with a high recycled content. The biggest problem faced by recycling is not the technological process of turning one thing into another. Anything can be recycled—and would be if demand for what it could be recycled into were great enough. The key, then, is demand, and demand for many recyclables is often soft. Consumers can increase demand by buying wisely. But to do so they will have to become garbage literate, because labels can be deceptive. For example, the word "recycled" on a package generally means not that a product has been made, at least in part, out of something that a consumer once bought and then turned in for recycling, but rather that it has been made in part with scrap left over from the normal manufacturing process—business as usual in any well-run factory. The label one needs to look for is "post-consumer recycled," and ideally the label will include a percentage, as in "30 percent post-consumer recycled." Anything above 10 percent is worthwhile.

Finally, the garbage problems that the United States has experienced will have had an unexpected welcome outcome if they drive home a lesson relevant to multiple public policy issues: namely, that public and political *notions* of our situation and what our situation really *is* do not match. In many cases they do not even closely approximate each other. This conclusion has emerged time and again from Garbage Project studies. Disdained commodity though it is, garbage offers a useful, if ironic, reminder of one of the fundamentals of critical self-knowledge—that we do not necessarily know many things that we think we know. That is not the usual starting point of most discussions in America, especially political ones. But it is not a bad starting point at all.



Book reviews

The Man Who Knew Infinity: A Life of the Indian Genius Ramanujan
Robert Kanigel
Scribners, $27.95
Washington Square Press, $12 paper

If you were once an eager mathematics student and still bristle at the memory of losing points on seventh-grade tests for supplying correct answers but insufficient proofs (or no proofs), you can avenge yourself. FedEx a copy of *The Man Who Knew Infinity* to that exacting teacher who nudged callow mathematicians toward other professions.

Ramanujan's genius was rooted in intuition. His capacity for the scholarly epiphany inspired awe among his peers, including G. H. Hardy, the early 20th-century emir of British mathematics. "[Ramanujan's] ideas," wrote Hardy, "as to what constituted a mathematical proof were of the most shadowy description. All his results, new or old, right or wrong, had been arrived at by a process of mingled argument, intuition, and induction, of which he was entirely unable to give any coherent account." Unwittingly concurring, Ramanujan had once explained his method in 1914: "Immediately I heard the problem it was clear that the solution should obviously be a continued fraction; I then thought, Which continued fraction? And the answer came to my mind."

Srinivasa Ramanujan Iyengar, a poor South Indian Brahmin, was born in 1887 with a yen for mathematics and an ability to solve complex problems at a single glance. He impressed some teachers with his talents, but confounded more with rapt disquisitions on metaphysics (he once argued that mathematical formulas were manifestations of the mind of God). After failing at two colleges, he pursued a makeshift course of study, encouraged by his mother and a handful of outdated textbooks. Within a few years, he had independently rediscovered a century's worth of mathematics and begun churning out theorems that—more than 75 years later—would "sustain a veritable cottage industry of mathematicians devoted to their study."

By the time he reached his mid-20s, Ramanujan had not succeeded in winning recognition from fellow Indian mathematicians. So he looked to the West, sending letters of introduction to three British mathematicians in the hope that they might help him get his work published. Stymied by some of Ramanujan's equations—"wild theorems"—and vexed by the meager proofs, the redoubtable Hardy wrote back. A year later, at Hardy's invitation, Ramanujan reluctantly left his mother and child bride for what turned out to be a five-year mathematical retreat.

At Cambridge University's Trinity College, a kind of mathematician's Shangri-La, he talked shop with some of the world's most celebrated minds, produced some 20 major papers, founded, with Hardy, the field of probabilistic number theory and became a Fellow of the Royal Society, Britain's most prestigious scientific body. He returned to India in failing health after World War I, the pride of his country. He was only 32 when he died in 1920.

The Man Who Knew Infinity is an engrossing, energetically researched biography of a plump man with slender fingers and a blazing instinct for mathematics. The portrait that emerges alternately suggests an obsessive, quixotic genius unduly sensitive to perceived slights (on one occasion, Ramanujan disappeared from Cambridge for several days when Indian guests declined a third helping of soup he had prepared) and an inscrutable mathematician with a cabalistic understanding of numbers.

Robert Kanigel treats Ramanujan's paradoxes and preoccupations even-handedly. He doesn't dismiss his subject's intense religious faith. Nor does he segregate Ramanujan's beliefs from his mathematical interests. Instead, Kanigel writes that Ramanujan's "openness to supernatural influences hinted at a mind endowed with slippery, flexible, and elastic notions of cause and effect that left him receptive to what those equipped with more purely logical gifts could not see." There's a romantic Merchant-Ivory glaze to this observation, but, whatever the origins of Ramanujan's abilities, he did discern paths others could not find through mathematical thickets.

India honored Ramanujan in 1962 with a stamp bearing a 1919 portrait.

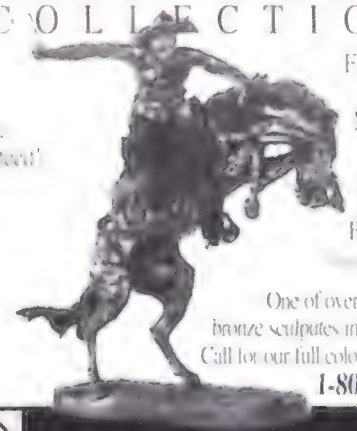
Kanigel fleshes out his biography with scenic, informative digressions on Hinduism, Indian geography, cricket, English public schools and the various histories and divergent concerns of Indian, British and Continental mathematics. Moreover, Kanigel explains some of Ramanujan's mathematical investigations in reader-friendly English—a feat that redounds to his credit.

It is only when discussing the precipitous deterioration of Ramanujan's health toward the end of his stay in England that Kanigel slips. Ramanujan faced various problems: cold weather, cultural isolation, wartime food rationing that restricted his vegetarian diet, tuberculosis, and other, undiagnosed maladies. Yet Kanigel argues, unconvincingly, that the compelling reason for Ramanujan's decline was G. H. Hardy's failure to indulge his colleague's spiritual needs and provide an intimate and sustaining friendship.

Despite this, *The Man Who Knew Infinity* is a discerning biography, a tantalizing vision of Ramanujan as more than a genius, if less than a prophet.

Nina Mehta is a book reviewer and writer who lives in New York.

THE HUNTINGTON BRONZE COLLECTION



Fine art bronze sculpture Made in USA

Bronco Buster

One of over 300 "lost wax" bronze sculptures in our collection. Call for our full color catalog today.

1-800-777-8126

401 E. Cypress • Visalia, CA 93277
FAX (209) 732-5961 MC/VISA

KITES

FREE COLOR CATALOG

Choose from over 200 exciting kites.
• Many unusual & innovative designs.
Call or write for your catalog today!

Into The Wind • (800) 541-0314
1408-R Pearl St., Boulder, CO 80302

Send for FREE dolphins poster and catalog.
141 Blackberry Inn G Weaverville, NC 28787

EXPLORING ANTARCTICA

Antarctica – a land like no other in the geography and history of the world. Hear the bellows of unruly seals and the chorus of seabird calls. Watch penguins in thousands skate, waddle and bellyride down glacial slopes.

Join us aboard the 138-passenger *World Discoverer**, the legendary expedition ship with over 50 voyages to Antarctica to her credit.

DEPARTURES:

Nov. 21, 1992	Falklands/Antarctica	22 days
Dec. 9, 1992	Antarctica	15 days
Feb. 14, 1993	Antarctica	15 days
Feb. 25, 1993	Antarctica/Chilean Fjords	20 days

Call toll-free at 800-325-0010, or see your travel agent.

CLIPPER
In The Spirit Of Adventure

7711 Bonhomme Ave. ✦ St. Louis, MO 63105

* *World Discoverer*, Registry Liberia

Additional reading

Signed languages (p. 30)

When the Mind Hears by Harlan Lane, Random House, 1984

Seeing Voices by Oliver Sacks, University of California Press, 1989

What the Hands Reveal about the Brain by Howard Poizner, Edward S. Klima, Ursula Bellugi, MIT Press, 1987

Deaf Heritage: A Narrative History of Deaf America by Jack R. Gannon, National Association for the Deaf (Silver Spring, Maryland), 1981

The Signs of Language by Edward S. Klima and Ursula Bellugi, Harvard University Press, 1979

Simultaneous Communication, ASL, and Other Classroom Communication Modes, edited by William Stokoe, Linstok Press (Burtonsville, Maryland), 1992

Rose rustling (p. 44)

In Search of Lost Roses by Thomas Christopher, Summit Books (New York), 1989

Antique Roses for the South by William C. Welch, Taylor Publishing (Dallas), 1990

Landscaping with Antique Roses by Liz Druitt and G. Michael Shoup, Taunton Press (Newtown, Connecticut), 1992

Classic Roses by Peter Beales, Holt, Rinehart and Winston, 1985

History of the Rose by Roy E. Shepherd, Earl M. Coleman (New York), 1978

Roses of America: The Brooklyn Botanic Garden's Guide to Our National Flower by Stephen Scanniello and Tania Bayard, Henry Holt & Company, 1990

Arata Isozaki (p. 58)

Arata Isozaki: Architecture 1960-1990, Museum of Contemporary Art (Los Angeles) and Rizzoli, 1991

Arata Isozaki: 1959-1978, GA Architect 6, A.D.A. Edita (Tokyo)

"Arata Isozaki: From Japan, A New Wave of International Architects" by Joseph Giovannini, *New York Times Magazine*, August 17, 1986

Arata Isozaki (video), Michael Blackwood Productions (New York), 1985

Arata Isozaki II (video), Michael Blackwood Productions, 1991

Fossil footprints (p. 70)

"Footprints from the Dawn of Time" by Jerry MacDonald, *Science Probe* (Farmingdale, New York), July 1992

"Sleuth Hot on Trail of Prehistoric Beasts" by Keith Whelpley, *New Mexico*, September 1990

"Tracking Down the Early Permian" by Larry S. Bowlds, *Geotimes*, American Geological Institute (Alexandria, Virginia), May 1989

The Practical Paleontologist by Steve Parker, Simon & Schuster, 1990

Battle of San Jacinto (p. 82)

The Raven: A Biography of Sam Houston by Marquis James, Blue Ribbon Books (New York), 1929

The Day of San Jacinto by Frank X. Tolbert, Jenkins (New York), 1959

The Texans by David Nevin and the Editors of Time-Life Books (Alexandria, Virginia), 1975

"The San Jacinto Campaign" by Eugene C. Barker, *Quarterly of the Texas State Historical Association*, Vol. IV, No. 4, April 1901

Brushtail possums (p. 92)

The Handbook of New Zealand Mammals, edited by Carolyn M. King, Oxford University Press, 1990

Alaska Highway (p. 102)

Northwest Epic by Heath Twichell, St. Martin's Press, 1992

Crooked Road: The Story of the Alaska Highway by David A. Remley, McGraw-Hill, 1976

North to Alaska! by Ken Coates, University of Alaska Press, 1992

Garbage (p. 113)

Rubbish! The Archaeology of Garbage by William Rathje and Cullen Murphy, HarperCollins, 1992

Rush to Burn: Solving America's Garbage Crisis? (articles from *Newsday*), Island Press (Washington, D.C.), 1989

"Once and Future Landfills" by William Rathje, *National Geographic*, May 1991

Smithsonian highlights

Planning a Smithsonian visit?

The VHS video *Guide to the Smithsonian* is an excellent aid for previsit planning. For ordering information and the free Associates' Planning Packet, send a postcard to Associates' Reception Center, Smithsonian, Washington, D.C. 20560, or call (202) 357-2700; TDD for hearing-impaired visitors, (202) 357-1729.

Begin your visit at the Smithsonian Information Center, located in the Castle. Hours are 9 A.M. to 5:30 P.M. daily.

Extended summer hours

Three Smithsonian museums are operating on extended summer hours, from 9:30 A.M. to 7:30 P.M. daily, through Labor Day, Monday, September 7: National Air and Space Museum, National Museum of American History and National Museum of Natural History.

Freer remains closed

The Freer Gallery of Art is closed until May 1993.

Festival of American Folklife

The 26th annual Smithsonian Folklife Festival is being held on the Mall June 25-29 and July 2-5, from 11 A.M. to 5:30 P.M. This year's festival features New Mexico, workers at the White House, American Indian musicians, and the Maroons. Events include craft demonstrations, music, dance, storytelling. For daily highlights, call (202) 357-4574.

Special July exhibits and events

Hirshhorn Museum & Sculpture Garden
Crosscurrents of Modernism: Four Latin American Pioneers (through September 7) Artists Diego Rivera, Joaquín Torres-García, Wifredo Lam and Matta.

National Air and Space Museum
Star Trek (through September 7) Exhibit marking the 25th anniversary of the famed TV series. Passes required daily; call (202) 786-2122 for details.

National Museum of American History
American Encounters Exhibition focuses on the American Indian, Hispanic and Anglo-American cultures of New Mexico's Upper Rio Grande Valley.
First Ladies: Political Role and Public Image New permanent installation.

National Museum of Natural History
Seeds of Change (through May 23, 1993) Exhibit explores the changes brought about by the exchange, begun 500 years ago, of five "seeds" between the Old World and the New.

National Museum of African Art
Recent Acquisitions/New Dimensions (through September 27) The work of modern artists from Nigeria, Côte d'Ivoire, South Africa, Kenya.

Arthur M. Sackler Gallery
When Kingship Descended from Heaven: Masterpieces of Mesopotamian Art from the Louvre (through August 9) Some of the world's most celebrated works of art.

National Portrait Gallery
Noble Heritage: Five Centuries of Portraits from the Hosokawa Family (July 24-November 29) Images, from the 14th to the 19th centuries, of members of this prominent Japanese family.
Recent Acquisitions (July 16-December 14) Portraits of notable Americans.

National Museum of American Art
Ralph Eugene Meatyard: An American Visionary (July 17-October 18) Unconventional, expressionistic images by the innovative photographer.
Helen Levitt (July 17-October 18) The work of one of the masters of 20th-century American photography.

Renwick Gallery
John McQueen: The Language of Containment (through July 26) Exhibition of 43 baskets by one of America's most important craftsmen.

Anacostia Museum
To Achieve These Rights: The Struggle for Equality and Self-Determination in the District of Columbia, 1791-1978 (through September 30) Exhibit examines the struggle by black people to secure equal rights in the nation's capital.

Arts and Industries Building Experimental Gallery
Psychology: Understanding Ourselves, Understanding Each Other (through September 9) Hands-on exhibition helps children and adults explore their own psychological processes.

S. Dillon Ripley Center Concourse
Views of Paradise: Tile Paintings by Marie Balian (through July 26) Large painted tile panels from Jerusalem.

Cooper-Hewitt Museum (New York)
The Cooper-Hewitt Collections: A Design Resource (through August) Some 1,200 objects chronicle the history of the important repository of design.

Smithsonian on the air

Dialogue New weekly radio series on national and international affairs features conversations with renowned scholars, political figures. Series is produced by the Woodrow Wilson International Center for Scholars in association with Radio Smithsonian. Check local listings.

Smithsonian National Associates

The National Associate Program U.S. and International Events will participate in "An Appalachian Summer," in Boone, North Carolina, this month. The program (July 14-15, 21-22 and 28-30) will include lectures on the art of Paul Gauguin and the world in 1492.

For information, write or call U.S. and International Events Program, 490 L'Enfant Plaza, S.W., Suite 4210, Washington, D.C. 20560; (202) 287-3210.

Resident Associate Program

To become a Resident Associate, or for fee and ticket information, call (202) 357-3030. July events include:
The Life and Death of Nicholas II (July 15; 8 P.M.) Russian playwright Edvard Radzinsky discusses his new book.

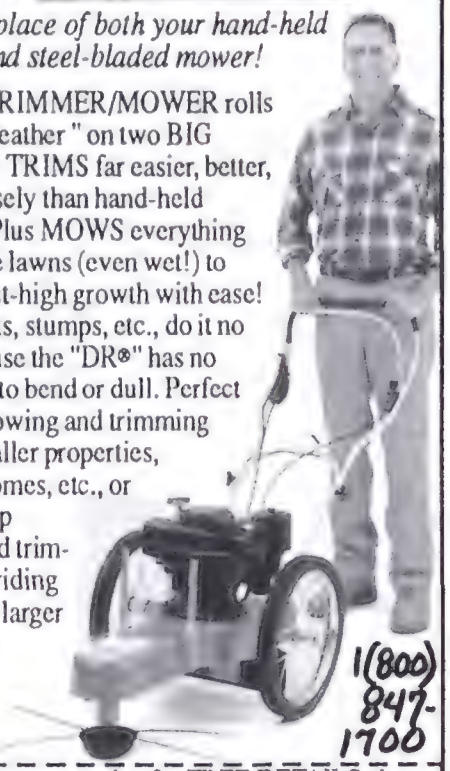
Smithsonian Institution Traveling Exhibition Service

SITES organizes and circulates exhibitions to cities throughout the United States and abroad. To sponsor a show in your community, write SITES, Smithsonian, Washington, D.C. 20560. One of the many July exhibits:
• Columbus, Ohio (July 18-August 16) *Seeds of Change* (panel exhibition), Columbus Metropolitan Library.

New TRIMMER *ON WHEELS!*

Takes the place of both your hand-held trimmer and steel-bladed mower!

The DR® TRIMMER/MOWER rolls "light as a feather" on two BIG WHEELS! TRIMS far easier, better, more precisely than hand-held trimmers. Plus MOWS everything from whole lawns (even wet!) to tough, waist-high growth with ease! Rocks, roots, stumps, etc., do it no harm because the "DR®" has no steel blade to bend or dull. Perfect for ALL mowing and trimming around smaller properties, vacation homes, etc., or for finish-up mowing and trimming after riding mowers on larger parcels. A delight for *anyone* to use!



1(800) 847-1700

Please mail coupon today for FREE DETAILS about the Revolutionary DR® TRIMMER/MOWER, including prices of Manual, Electric Starting and PRO-Models, "Off- Season" Savings now in effect, and 30 Day Risk-Free Trial. There is no obligation.

Name_____

Address_____

City_____ State_____ ZIP_____

To: COUNTRY HOME PRODUCTS, Dept. 47207
Box 89, Ferry Road, Charlotte, VT 05445

© 1992 CHP, Inc.

Back Pain Relief

Break the cycle of pain with *The Back Machine™*. Tested by doctors, physical therapists, and chiropractors and used by thousands, *The Back Machine* massages, stretches, and mobilizes while providing traction and extension. And it feels good!

60-Day Home Trial

We're so confident you'll experience relief from back pain that we offer *The Back Machine* with an unconditional 60-day money back guarantee.

Call or Write Today For FREE BROCHURE AND VIDEO

1-800-433-5599

Name_____

Address_____

City_____

State____ Zip_____

Eve Phone (____) _____

Back Technologies
2525 West Casino Road • Everett, WA. 98204
1-800-433-5599
© 1992 Back Technologies Inc. **Dept. 359**

The Smithsonian Traveler

THE LATEST WORD ON TOURS, EXPEDITIONS AND

Foreign Study Tours

Countryside Tours *July-October* Relaxing sojourns in France, England, Wales, Czechoslovakia, Italy, Switzerland, Germany, Greece and Mexico.

China *July-October* Several tours.

Islands of Indonesia *September 3-24*

Environmental Cruise (Europe) *September 9-22*

Byzantium Cruise *September 9-23*

NEW **United Germany** *September 10-24*

Southern Italy and Sicily *September 11-25*

Madagascar *September 11-28*

Canadian Rockies *September 12-23* Hiking.

English Canals *September 12-24*

Journey of Odysseus *September 13-29*

Black Sea Cruise *September 20-October 3*

Paradors of Spain *September 26-October 9*

NEW **Sojourn in Asia Minor** *September 28-October 11*

Himalayan Kingdoms *October 1-20*

Soviet Union Transformed *October 7-17*

NEW **Battlefields of France and Belgium** *October 9-22*

NEW **Atlantic Crossing** *October 18-November 5* Aboard the *Sea Cloud.*

Copper Canyon (Mexico) *October 23-30*

NEW **Japan Arts** *October 25-November 7*

Mexico Folk Art *October 27-November 8*

NEW **Borneo and Indonesia Cruise** *October 27-November 15*

London Interlude *October 29-November 7*

NEW **Hidden India** *October 29-November 22*

NEW **Columbus in the Caribbean** *November 4-14* Aboard the *Sea Cloud.*

Christmas in Winchester *December 17-28*

City Interludes (January-April) Off-season tours of London, Paris, Prague, Tibet, Florence, Hong Kong, Venice, Vienna, St. Petersburg, Edinburgh and Kyoto.

Tanzania *January 5-24*

Baroque Winter (Austria) *January 6-16*

Chile-Argentina *January 9-22*

India Wildlife Safari *January 17-February 11*

NEW **Western Caribbean Cruise** *February 1-11*

Dominican Republic *February 6-16* Whale watching.

Dominica *February 10-18*

Lapland Reindeer Safari *February 21-March 2*

Odyssey Tours

Low-cost Tours *1992-93* Great Britain, Italy, France, Greece, Portugal-Spain-Morocco, Alps, Israel-Egypt, Belize-Guatemala, Canada and the United States. Six tours to Costa Rica will also be offered. For an Odyssey brochure only, call 1-800-932-8287.

Domestic Study Tours

Smithsonian "Anytime" Weekend (Washington, D.C.) New low prices from $99 per person for a two-night package.

Olympic Park-Mount Rainier *September 5-13*

Pacific Northwest-Columbia River Cruise *September 5-18*

NEW **Great Camps of the Adirondacks** *September 12-19*

Smithsonian Focus: The Natural Sciences (Washington, D.C.) *September 13-16* For Sponsoring Members.

Arches and Canyonlands *September 19-26*

New York Theater *September 24-27*

Grand Canyon *September 24-27 or October 8-10*

NEW **Crow Canyon Archaeology (Colorado)** *September 27-October 3*

NEW **California's National Parks** *October 4-12*

Sojourn in Sedona (Arizona) *October 8-14*

NEW **Chesapeake Birds** *October 24-November 1*

Christmas in Williamsburg *December 10-13*

Christmas at the Smithsonian *December 17-20*

Christmas in Santa Fe *December 20-27*

NEW **Rocky Mountain New Year's for Families** *December 26-January 1*

Yellowstone *February* Cross-country skiing.

Write to Smithsonian National Associate Program, Washington, DC 20560 or call (202) 357-4700 for tours and seminars, (202) 287-3210 for expeditions.

South Texas Birds *February 13-20*

Baja Whale Watch *February 25-March 3*

Seminars

Operation Desert Storm (Washington, D.C.) *September 10-12*

Writing from Nature (Jackson Hole, Wyoming) *September 15-19*

French Riviera *September 18-30*

Creative Writing (Annapolis) *September 20-24*

Aircraft Restoration (Washington, D.C.) *September 21-24*

Fabric and Furniture (Los Angeles) *September 22-26*

The American Avant-Garde (New York) *September 29-October 3*

Atomic Age (Los Alamos) *September 29-October 3*

Yellowstone Ecology (Wyoming) *October 5-11*

Civil War in Atlanta *October 8-11*

Catalina Island Ecology (California) *October 12-16*

Northwest Crafts (Seattle) *October 13-18*

Antietam *October 15-18*

Seminars in Santa Fe *October 18-22* Archaeology, literature and art, or cooking.

Women of the West (Santa Fe) *October 28-31*

History of Photography (France) *November 1-10*

The Power of Maps (New York) *November 7-11*

Gettysburg *November 11-14*

Research Expeditions

Contribute your talent and financial support to Smithsonian research.

Washington, D.C. *July 19-August 1* Archive documents at the Air and Space Museum.

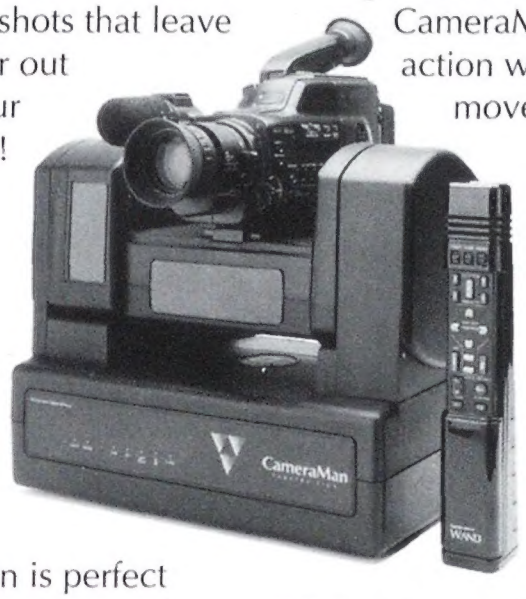
Edgewater, Maryland *August 2-8 and August 9-15* Assist in research on environment and plants.

Crow Agency, Montana *August 12-18* Document the annual Crow Fair.

Front Royal, Virginia *September 12-26* Research wildlife in the Shenandoah Valley.

TEST DRIVE THE ULTIMATE VIDEOMAKING MACHINE!

If you're tired of home videos marred by jittery camera moves, muddy sound, and shots that leave the camera operator out of the fun, meet your new CameraMan™! The revolutionary CameraMan video system gives you amazing options for shooting professional-quality videos -- *without* getting stuck behind the camera. CameraMan is perfect for corporate videomaking and desktop presentations too!



Now you can star in your own productions — while CameraMan tracks the action with smooth camera moves and superb sound. Or use the Wand™ to control pans, tilts, and zooms from distances up to 100 feet. You can even auto-cycle among pre-set locations and zoom settings! Send for our FREE video, and test-drive the ultimate videomaking machine!

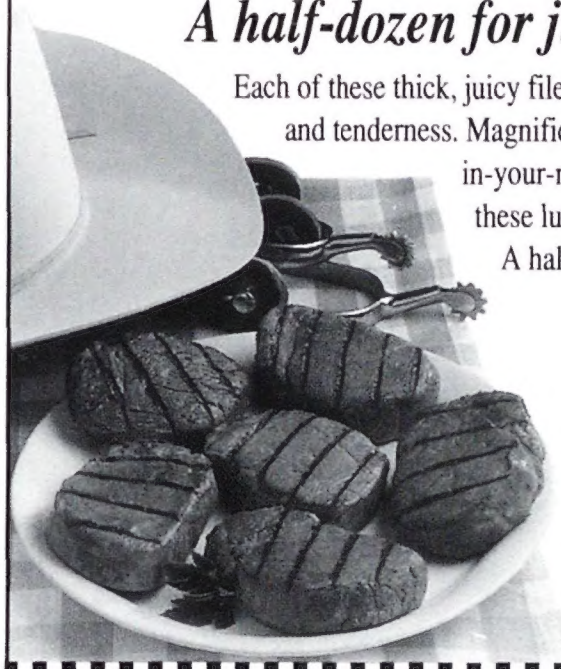
For a Free Video and Brochure, Call 1-800-231-1759 or Write Today!

CameraMan™
PARKERVISION
8493 Baymeadows Way, Jacksonville, FL 32256

CameraMan is a trademark of ParkerVision, patents pending. Camcorder not included.

Enjoy the prize-winning flavor of these select filets tomorrow night.

A half-dozen for just $29.95–save $30!



Each of these thick, juicy filets are hand-selected for their blue ribbon quality and tenderness. Magnificently marbled, perfectly aged for that buttery, melt-in-your-mouth flavor. Order by noon (CST) today and enjoy these luscious, restaurant-quality filets tomorrow.*
A half-dozen are yours for just $29.95... a $30 savings!

AMERICA'S BLUE RIBBON BEEF
FROM THE PEOPLE WHO KNOW QUALITY BEEF.

SATISFACTION GUARANTEED

A half-dozen Blue Ribbon filets mignons
Six ounces, 1-1/4" thick each;
flash frozen for prize-winning flavor, then shipped direct-to-you.
Item 1666: $29.95 ($59.95 value – save $30!)
Plus, $6.95 shipping and handling.
Limit three per customer. Offer expires August 31, 1992.

* For orders placed Monday-Thursday.

No extra charge for overnight delivery.
FEDERAL EXPRESS

For credit card orders or a free brochure call:
1-800-US-FILET
(1-800-873-4538)

America's Blue Ribbon Beef, Dept. #BSM7002C
485 Crossroads Parkway, Bolingbrook, IL 60440

By Barbara Holland

It was a wonderful toy and a glorious war

During the war in the Persian Gulf, we heard a lot about counseling for America's children, to help them conquer their anxieties. Either we're raising a generation of crybabies or war just isn't fun anymore. Not the way World War II was fun.

From a kid's-eye view, especially a kid in Washington, D.C., where air raid drills were serious stuff and our schools were full of exiled princesses, World War II was the greatest game of all, the best of all possible toys. Anxiety? What anxiety? Back then, children read and were read to, and the first great lesson of kids' books was that the dragon never eats the prince. We were good, Nazis were bad, Hitler was crazy. We would win. In the meantime, all over the neighborhood the 6-to-12-year-old world pitched in to help with the war effort.

The grown-ups' agenda for us was slightly different from our own. Grown-ups wanted us to go from door to door soliciting War Bond pledges. They wanted us to drag wagons through the streets collecting old newspapers and twisted eggbeaters and rusty potato-peelers, weapons guaranteed to drive the Axis powers whimpering back to their lairs. Mothers wanted us to eat the things they grew in the backyards—kale and Swiss chard and other insults—because kale consumption would bring the Luftwaffe down in flames.

This was nonsense, and we knew it. We had other plans. We knew what victory required of us, and it had nothing to do with vegetables.

Victory required us to lie on our backs in the grass all afternoon watching for German bombers cruising over Connecticut Avenue toward the White House, and alert the authorities (I seem to remember there was a number to call) in the nick of time. We had charts of silhouettes—our planes and theirs—and kept them propped on our chests. The sky was thick with planes, the grass was thick with kids, but I, always terminally nearsighted, was the only one who ever actually spotted any German bombers.

Victory required us to dig trenches across people's front lawns to trip up any infantry invasions through Northwest Washington. It required us to catch spies. The Rogerses were spies. They never had candy at Halloween (always a dead giveaway), and the bushes around their downstairs windows were overgrown to hide their activities. As evening fell, we wriggled through the forsythia tangle and peered into their lighted living room, waiting for them to speak German into a shortwave radio. None of us would have recognized German if we'd heard it, or a shortwave radio if we'd seen one, but for some things one can trust to instinct: we'd know.

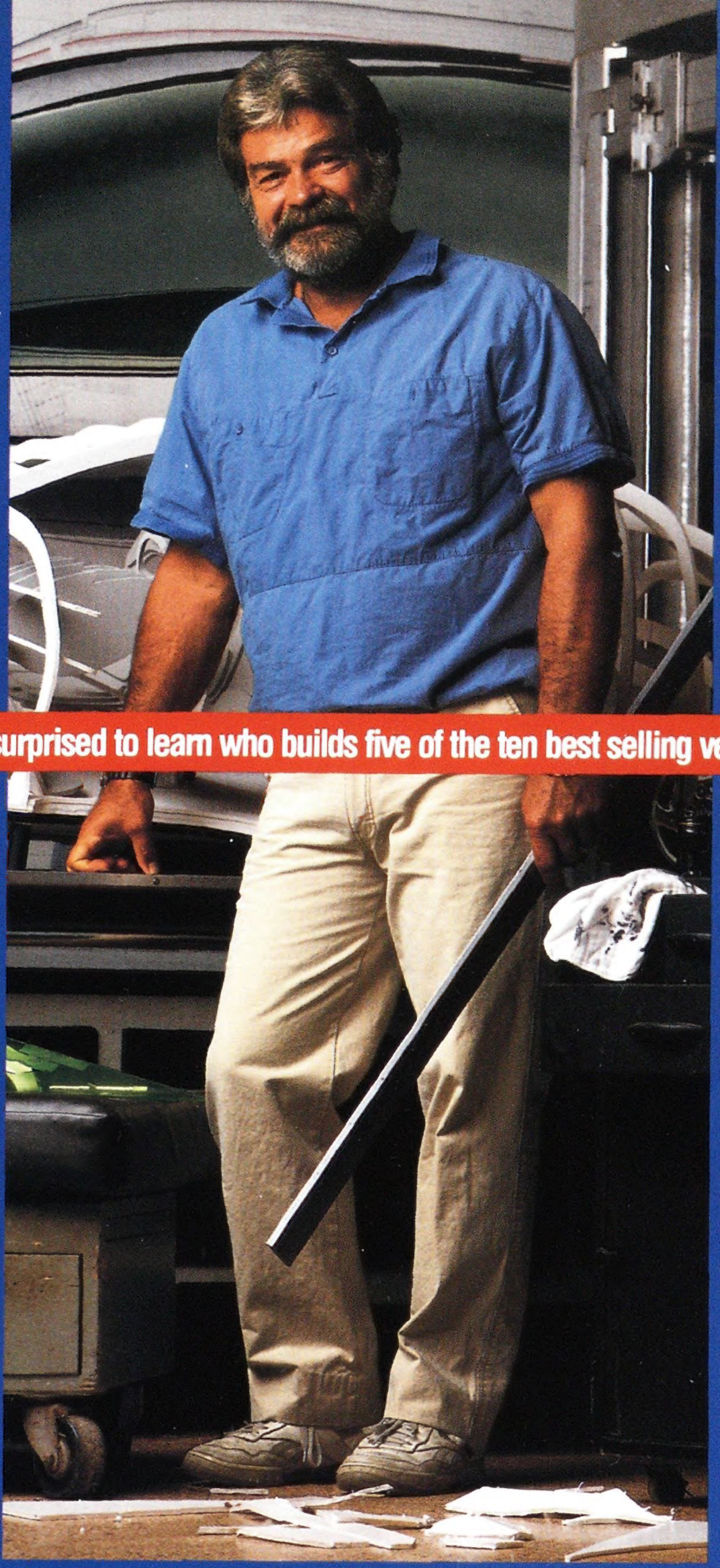
Peacefully, Mr. and Mrs. Rogers sat and read throughout their tranquil evenings, and their dog snoozed on the hearth, and outside we got pins and needles in our feet and spiders down our necks—but war, as Sherman said, is hell, and we endured until long past bedtime, night after night.

Aside from propaganda, nobody told us much, leaving us free to invent our own war. We hadn't the foggiest notion where Germany was, for instance; it could have been in Delaware—wherever that was. At school, the regular teachers had vanished into the services or lucrative war work, and the bewildered crew that replaced them may not have known much more than we did. Music class, always our main resource for history, geography, poetry and religion, was our strongest information link. In a glorious jumble that included martial airs from all previous wars—"Marching to Pretoria," "Marching Through Georgia," "Tipperary," et cetera—we sang the "Marines' Hymn" and "Praise the Lord and Pass the Ammunition," and we really put our backs into them. We also sang a hideous government-issue ditty that went something like this: "Clean up the nation from bottom to top / Start with yourself in the home and the shop," and sneered privately at the notion of Hitler shrinking terrified from our spotless floors and checkout counters. We knew him better than that—he was made of sterner stuff. But so were we.

We prepared for invasion. The boys practiced hand-to-hand combat; the girls constructed elaborate booby traps of clothesline and coat hangers, which occasionally netted the mailman. We stashed crackers and raisins in the vacant lot, prepared to hide out there and commit sabotage when our houses were occupied by enemy troops. There we dug holes, in which we planned to crouch until time to creep out and poison the Nazi general's orange juice; we brewed the poison from cigarette butts and laundry soap. We wrote out secret codes, memorized them and ate the paper. We communicated in invisible ink which, alas, remained permanently invisible. The better to penetrate enemy lines unrecognized, we practiced a kind of imitation German, full of *achtungs* and spit. Those of us old enough to own jackknives whittled scrap lumber into guns, which would surely, at least from a distance, fool entire enemy regiments into surrender. The rest of us made bows that shot lethal arrows tipped with purloined "illegal" substances—rubbing alcohol, ammonia, melted aspirin.

From morn till night we were busy, and happy, and out from underfoot. It was a wonderful toy and a glorious war, and while we rejoiced in victory when it came, life seemed savorless for a long time afterward.

They don't make 'em like they used to.



Al Gerstenberger: Ford Designer

"You might be surprised to learn who builds five of the ten best selling vehicles in America."

At Ford Motor Company, when we set out to design a new car or truck, we never forget that your opinion is the most important one. So, we get input from customers at every stage of new product development to find out exactly what you're looking for. That may be why five of the ten best selling vehicles in America are made by Ford Motor Company.*

Ford

Ford • Lincoln • Mercury • Ford Trucks

QUALITY IS JOB 1.℠ IT'S WORKING.

Buckle up–Together we can save lives.
*Based on 1991 Calendar Year sales data.

Always insist on genuine Ford Motor Company collision repair parts.

There's nothing as perfect as an iced cold "T&T."

Tanqueray

IMPORTED

Tanqueray

®

Imported English Gin, 47.3% Alc./Vol. (94.6°). 100% Grain Neutral Spirits. © 1992 Schieffelin & Somerset Co., New York, N.Y.